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VOL. XXVII.—NEW SERIES.

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OF

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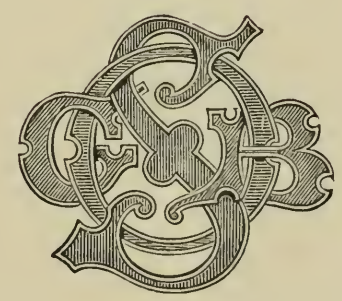

VOL. XXVII.—NEW SERIES

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Printed and Published for the Society by

JOHN BALE & SONS, 87-89, GT. TITCHFIELD STREET

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1885 Fothergill, J. A., M.R.C.S.Eng., L.D.S.Eng., D.D.S. Penn. 77, Northgate, Darlington.

1893 Fraser, Jas. Leslie, L.D.S.Edin. 5, Castle Street, Inverness.

1893 Gabell, Douglas Phillimore, L.D.S.Eng. 33, Brixton Road. S.W.

1893 Gardner, Ernest, L.D.S.Eng. 139, Victoria Street. S.W.

1875 Gartley, John A., L.D.S.Eng. 5, Sackville Street. W. (C. 1894.95.96.)

1874 Gibbings, Ashley, M.R.C.S.Eng., L.D.S.Eng. 18, Stratford Place. W. (C. 1882.83.84. L. 1889.90.91.92.93. V.P. 1894.95.96.)

1891 Gill, H. Beadnell, L.D.S.Eng. Chester Villa, Upper Norwood. S.E.

1887 Glaisby, Walter, L.D.S.Irel. 4, St. Leonards, York.

1892 Goddard, Henry Ernest, L.D.S.Glas. Oxford Street, Nottingham.

1893 Goodman, Wm. Henry, L.D.S.Eng. 16, Palace Gate, Exeter.

1888 Gould, Horace J., L.D.S.Eng. 18, Hanover Street. W.

1886 Grayston, William Cass, L.D.S.Irel. 1, Pavilion Terrace, Scarborough.

1890 Greenfield, John, L.D.S.Eng. 11, Brook Street, Hanover Square. W.

1857 Gregson, G., M.R.C.S.Eng., L.D.S.Eng. 63, Harley Street. W. (C. 1867.68.69.84. H.F.S. 1873. H.S. 1870.71.72. V.P. 1884.85.86.)

Elected

1874 Halliday, Middleton W., L.D.S.Eng. 4, Nottingham Street. W.

1894 Hall, Edward Caleb Joseph, L.D.S.Eng., 18, Orchard Street, Portman Square. W.

1892 Handley, C. W. Croft, L.D.S.Glas. The Elms, 15, High Street, Stoke Newington. N.

1894 Handley, John Trevor, L.D.S.Eng., 128, Green Lanes, Stoke Newington. N.

1877 Harding, Milward. 23, Park Square East, Regent's Park. N.W.

1867 Harding, T. Henry G., L.D S.Eng. 23, Park Square East, Regent's Park. N.W. (H.S. 1872.73.74. V.P. 1891.92.93.)

1874 Harding, William E., L.D.S.Eng. 28, Castle Street, Shrewsbury. (C. 1884.85.86. V.P. 1893.94-95-96.)

1883 Harris, A. Carpenter, M.R.C.S.Eng., L.D.S.Eng. 112, Harley Street. W.

1892 Harris, James Edwin, D.D.S.Mich., U.S.A. 122, Harley Street. W.

1891 Harris, Theodore Wm., L.D.S.Eng. 10, Cavendish Place. W.

1894 Harrison, Philip, L.D.S.Eng. 36, Finsbury Pavement. E.C.

1883 Harrison, Richard, L.D.S.Eng. 245, Camden Road. N.W.

1886 Harrison, Walter, L.D.S.Eng., D.M.D.Harvard. 6, Brunswick Place, Hove, Brighton.

1887 Hayman, C. A., L.R.C.P., L.R.C.S.Irel., L.D.S.Eng., L.D.S.Irel. 17, Victoria Square, Clifton, Bristol.

1894 Haynes, Frederick, L.D.S.Eng., 11, Hillmarton Road, Rugby.

1873 Hele, Warwick, L.D.S.Eng. 11, Portland Square, Carlisle. (C. 1883.84.)

1894 Henly, Albert William, L.D.S.Eng. 175, Victoria Street. S.W.

1863 Henry, George, L.D.S.Eng. 38, Wellington Square, Hastings. (C. 1873.74.75. V.P. 1894-95-96.)

1880 Henry, Martin, L.D.S.Eng. 63, Sandgate Road, Folkestone.

Elected

1895 Henry, Percy Francklin, L.D.S.Eng. 79, King William Street. E.C.

1876 Hepburn, David, L.D.S.Eng. 9, Portland Place, Cavendish Square. W. (C. 1887.88.89. H.S. 1884.85.86. V.P. 1890.91.92. P. 1895-96.)

1892 Hern, George, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. Eng. 18, Stratford Place. W.

1883 Hern, William, M.R.C.S.Eng., L.D.S.Eng. 18, Stratford Place. W. (C. 1890.91.92.)

1895 Hershell, Ridley, L.D.S.Eng. 6, Seaside Road, Eastbourne.

1879 Hogue, Wilson, D.M.D.Harvard. Vermont, Dean Park, Bournemonth. (C. 1892.93.94.95.)

1892 Holford, Walter Stanley, L.R.C.P.Lond., M.R.C.S. Eng., L.D.S.Eng. 23, Wimpole Street. W.

1893 Hope, Arthur Curling, L.D.S.Eng. Portland House, Guildford.

1893 Hope, Hubert L., L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. Eng. Portland House, Guildford.

1894 Hope, Vacey Limington, L.D.S.Eng. 42, Finsbury Square. E.C.

1892 Hopson, Montagu Frank, L.D.S.Eng. Grove House, Rosslyn Hill, Hampstead. N.W.

1891 Howkins, Thomas Maudsley, L.D.S.Irel. 57, Victoria Street, Great Grimsby.

1886 Hughes, Morgan, M.R.C.S.Eng., L.D.S.Eng. Eastbridge, Addiscombe Road, Croydon.

1880 Hugo, George Joseph, 15, Allez Street, New Town, Guernsey.

1858 Hugo, Samuel George Joseph. 15, Allez Street, New Town, Guernsey.

1894 Hull, Charles Septimus, L.D.S.Glas. 78, Abingdon Street, Northampton.

1883 Humby, W. R., L.D.S.Eng. 88, Newgate Street. E.C. (C. 1893.94.95.96.)

1871 Hunt, William A., L.R.C.P.Lond., M.R.C.S.Eng. Pen Villa, Yeovil. (C. 1879.80.81.)

1874 Hutchinson, S. J., M.R.C.S.Eng., L.D.S.Eng. 64, Brook Street. W. (H.S. 1879.80. Curator 1881.82.83.84.85. V.P. 1886.87.88. P. 1891. T. 1893.94.95.96.)

Elected

1889 Huxley, F. Earle, M.R.C.S.Eng., L.D.S.Edin. 23, Waterloo Street, Birmingham. (C. 1894.95.96.)

1887 James, W. E., L.D.S.Irel. 14, Claremont Road, Surbiton.

1894 Jarvie, William, M.D.S. 105, Clinton Street, Brooklyn, N.Y.

1881 Jewers, Ernest E., L.D.S.Eng. 3, Athenæum Terrace, Plymouth.

1863 Karran, J. 8, Finch Road, Douglas, Isle of Man.

1875 Keeling, G. R., L.D.S.Eng. Ormonde House, Epsom.

1889 Kendall, W. H., L.D.S.Eng. 25, Finsbury Square. E.C.

1887 Kendrick, Alfred, L.D.S.Eng. Bridge House, Taunton.

1867 King, R. F. H., L.D.S.Eng. Appleton Gate, Newark.

1885 Kirby, Alex, L.D.S.Eng. 8, Harpur Place, Bedford.

1887 Kissack, Frank H., L.D.S.Eng. 17, Bentinck Street, Manchester Square. W.

1886 Kluht, Henry J., L.D.S.Glas. 156, Westbourne Grove. W.

1891 Knowles, Vernon, L.D.S.Eng. Kendrick View, London Road, Reading.

1894 Leigh, Percival T., L.D.S.Eng. & Glas. 6, Portland Crescent, Leeds.

1877 Levason, Arthur G., L.D.S.Irel. 12, Bridge Street, Hereford.

1886 Levason, Peyton Grenville, L.D.S.Eng. 12, Bridge Street, Hereford.

1882 Lloyd-Williams, E., L.R.C.P.Lond., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 2, James Street, Buckingham Gate, S.W. (C. 1892. Ed. Trans. 1893.94-95-96.)

1867 Longhurst, Henry Bell, L.D.S.Eng. 28, Old Burlington Street, W. (C. 1877.78.79.)

1883 Lucas, George J., L.D.S.Edin. Lindon Lodge, Northfleet, Gravesend; and 23, Northumberland Avenue. S.W.

1869 McAdam, George C., L.D.S.Eng. King Street, Hereford. (C. 1884.85. V.P. 1887.88.89.)

1884 McCall, John H., L.D.S.Eng. The Spa, 13, Belvoir Street, Leicester. (C. 1893.94.95-96.)

Elected

1876 Macgregor, Malcolm, L.D.S.Edin. 20, Queen Street, Edinburgh.

1895 Mackley, Ernest H. A., L.D.S.Eng. 74, Upper St. Giles Street, Norwich.

1876 MacLeod, William B., F.R.S.Edin., L.D.S.Edin. 16, George Square, Edinburgh. (C. 1888. V.P. 1889.90. 91. P. 1893.)

1880 Maggs, William Adolphus, L.R.C.P.Lond., M.R.C.S. Eng., L.S.A., L.D.S.Eng. 16, Hanover Square, W. (H.F.S. 1890. H.S. 1891.92.93. L. 1894.95.96.)

1876 Mallet, Gilbert, 28, Bartholomew Street, Newbury.

1892 Mansbridge, Josiah, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. 112, Harley Street, W.

1882 Mansell, Thos., L.D.S.Edin. 29, Hamilton Square, Birkenhead.

1894 Manton, Edward A., L.D.S.Eng. 14, Grand Rue, Boulogne-sur-Mer.

1881 Margetson, W. E., M.R.C.S.Eng., L.D.S.Eng. Roscoe House, Leeds Road, Dewsbury.

1886 Markham, R. L., L.D.S.Irel. 9, Eldon Square, Newcastle-on-Tyne.

1893 Martin, Gavin W., L.D.S.Eng. 7, Cambridge Road, Harrogate.

1862 Martin, J. H. C., M.D.Edin., M.R.C.S.Eng., L.D.S.Eng. Cambridge House, Portsmouth. (C. 1871.72.73.)

1875 Martini, Luigi, M.D. Trasloco in Via Barbaroux 2, Turin, Italy.

1882 Mason, Charles Browne, L.D.S.Eng. 5, The Crescent, Scarborough. (C. 1895-96.)

1877 Mason, Henry B., L.D.S.Eng. 3, Bedford Circus, Exeter. (C. 1890.91.92.)

1880 Matheson, Leonard, L.D.S.Eng. 22, Wimpole Street, W. (C. 1889.90.)

1876 Matthew, Charles, L.D.S.Edin. 15, Ainslie Place, Edinburgh.

1883 Matthews, A. Alexander, L.D.S.Eng. 12, North Parade, Bradford.

1888 Matthews, Wm., L.D.S.Eng. Brooklands, West Kirby, Cheshire.

Elected

1879 May, Percy, M.R.C.S.Eng., L.D.S.Edin. 15, Endsleigh Gardens. N.W.

1894 May, Walter John, L.D.S.Eng. Dental Hospital of London, 40, Leicester Square. W.C.

1894 Mellersh, William Francis, L.D.S.Eng. 7, Wyburn Villas, Ewell Road, Surbiton.

1877 Merson, Frank, 36, East Street, South Molton.

1878 Merson, James, L.D.S.Eng. 28, Harley Street, W.

1874 Merson, William, L.D.S.Eng. Lainston Lodge, Bournemouth.

1892 Messenger, Henry Williams, L.D.S.Irel. Clairville, 47, Rosslyn Hill, Hampstead. N.W.

1868 Mitchell, F. W., L.D.S.Eng. 176, Clapham Road. S.W.

1888 Mitchell, Wm., D.D.S.Mich. 39, Upper Brook Street, Grosvenor Square. W.

1892 Moon, William Draper, L.D.S.Eng. 8, Jesmond Road, Newcastle-on-Tyne.

1894 Morley, Frank, L.D.S.Eng., 42, Albemarle Street. W.

1857 Morley, Henry, L.D.S.Eng., Trinity Terrace, London Road, Derby. (C. 1869.70.)

1874 Mummery, John Howard, M.R.C.S.Eng., L.D.S.Eng. 10, Cavendish Place. W. (C. 1885.86. H.F.S. 1881.82. 95.96. H.S. 1883.84. V.P. 1887.88.89. P. 1892.)

1884 Mundell, Stephen, L.D.S.Eng. 38, West Southernhay, Exeter.

1895 Nash, Thomas L., L.D.S.Edin. 39, Church Street, Inverness.

1889 Neale, W. H. Breward, L.D.S.Irel. 7, Newall Street, Birmingham.

1882 Newland-Pedley, F., F.R.C.S.Eng., L.D.S.Eng. 32, Devonshire Place, Portland Place. W. (C. 1890.91.92.)

1883 Newton, Fredk. Harriss, L.D.S.Eng. 30, George Street, Hanover Square. W.

1895 Nicol, J. Main, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. 2, Clarendon Road, Leeds.

1879 Noble, Chas. J., L.D.S.Eng. 96, Cornwall Gardens. S.W.

Elected

1893 Northcroft, George, L.D.S.Eng. 4a, Portman Mansions. W.

1874 Northrop, A. L., D.D.S. 57, West Forty-ninth Street, New York City.

1859 O'Meara, Alfred. Kennedy Lodge, Simla, India. (V.P. 1879.80.81.)

1894 Oram, Charles Henry, L.D.S.Eng. South Molton.

1859 Orphoot, Peter, M.D.Edin. 113, George Street, Edinburgh. (V.P. 1868.69.70.72.73.74.)

1884 Pallant, Arthur, L.D.S.Irel. Orchard House, Maidenhead.

1859 Palmer, James Edwin. Priestgate, Peterborough. (C. 1881.82.)

1895 Pare, John William, M.D., C.M.Edin., L.D.S.Eng. 18, Portland Place. W.

1885 Parkinson, Herbert S., L.D.S.Eng. 40, Brook Street. W.

1860 Parks, William J., L.D.S.Eng. 27, Newington Crescent, Kennington Park Road. S.E.

1883 Paterson, Hugh, 6, Lyon's Terrace, Liverpool Road, Hyde Park, Sydney, N.S.W.

1887 Paterson, W. Bromfied, F.R.C.S.Eng., L.D.S.Eng. 64, Brook Street. W. (C. 1894.95-96.)

1877 Payne, Arthur G. Netley, Old Christchurch Road, Bournemouth.

1880 Pedley, George, 17 and 18, Railway Approach, London Bridge. S.E.

1889 Pedley, R. Denison, F.R.C.S.Edin., M.R.C.S.Eng., L.D.S.Eng. 17, Railway Approach, London Bridge. S.E.

1885 Penfold, W., L.D.S.Irel. 30, York Street, Portman Square. W.

1880 Pike, J. L. F., L.D.S.Eng. 273, Glossop Road, Sheffield.

Elected

1894 Pillin, Harry Linsell, L.D.S.Eng. 33, George Street, Hanover Square. W.

1871 Platt, Leon J., L.D.S.Edin. 64, Murray Place, Stirling.

1882 Poinsot, P. H. V. 34, Rue de la Victoire, Paris.

1895 Porter, Frank C., L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. 12, Oxford Street, Nottingham.

1863 Porter, W. P. 44, Finsbury Pavement. E.C.

1882 Power, Thos. Henry, L.D.S,Irel. Southwold, Walton-on-Thames.

1859 Pratt, R. J. H. Westfield, Putney Hill. S.W.

1893 Preedy, Ed. John, L.D.S.Eng. 1, Hanover Square. W.

1883 Price, Rees, L.D.S.Eng. 163, Bath Street, Glasgow.

1894 Price Rhys, L.D.S.I., 252, Clapham Road. S.W.

1883 Quinby, Henry Clay, L.D.S.Irel. 21, Rodney Street, Liverpool. (C. 1892.93.94.95.)

1883 Quinby, Melville G. C. 21, Rodney Street, Liverpool.

1889 Read, Henry G., L.R.C.P.Lond., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 30, Finsbury Square. E.C.

1882 Read, Thomas, L.D.S.Eng. 31, Cavendish Square. W.

1889 Read, Thos. George, L.D.S.Eng., D.M.D.Harv. 31, Cavendish Square. W.

1876 Reading, Edward. Elizabeth Street, Hyde Park, Sydney, N.S.W.

1892 Reading, Philip Burdett, L.D.S.Eng. 48, College Street, Hyde Park, Sydney, N.S.W.

1888 Reading, Richard Fairfax, L.R.C.P.Lond., M.R.C.S. Eng., L.D.S.Eng. 151, Marquarie Street, Sydney, N.S.W.

1871 Redman, J. H., L.D.S.Irel., D.D.S.Phil. 61, Old Steine, Brighton. (C. 1887.88.89. V.P. 1890.91.92.)

1890 Reinhardt, J. Hasty, L.D.S.Irel. 384, Brixton Road. S.W.

Elected

1889 Rhodes, W. A., L.D.S.I. 3, Silver Street, Cambridge.

1893 Richards, F. W., L.D.S.Eng. 27, Paradise Street, Birmingham.

1889 Richards, George Oliver, M.R.C.S.Eng., L.D.S.Eng. Onslow House, 9, The Green, Richmond, Surrey.

1890 Rilot, Charles F., L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. Eng. 22, Wimpole Street. W.

1882 Robbins, Cornelius, L.D.S.Eng. 32, Oxford Road, Kilburn. N.W. (C. 1891.92.95.96. H.S. 1893.94.95.)

1886 Roberts, Chas. Alfred, L.D.S.Eng. 19, Weymouth Street, Portland Place. W.

1876 Robinson, George. Eden Street, Oamaru, New Zealand.

1877 Rogers, Claude, M.R.C.S.Eng., L.D.S.Eng., D.M.D. Harvard. 142, Harley Street. W. (H.F.S. 1883.)

1856 Rogers, Henry, M.R.C.S.Eng., L.D.S.Eng. 16, Dorset Square. N.W. (C. 1872.73.)

1863 Rogers, R., L.D.S.Irel. Alma House, Rodney Place, Cheltenham. (C. 1883.84. V.P. 1886.87.88.)

1856 Rogers, Thomas Arnold, M.R.C.S.Eng., L.D.S.Eng. 23, Endsleigh Street, Tavistock Square. W.C. (C. 1869.70.71.83.84.87. H.S. 1856.57.58.59. H.F.S. 1860.61. V.P. 1862.63.64.79.80. P. 1865 and 81. L. 1872.73.74.75.76.77.78. T. 1888.89.90.91.92.)

1895 Rooke, Frederick James Frankland, L.D.S.Eng. 42, Kensington Gardens Square. W.

1882 Rose, Harry, L.D.S.Eng. 59, Queen Anne Street. W. (C. 1893.94-95.)

1892 Roughton, Edmund W., M.D.Lond., B.S., F.R.C.S.Eng. 33, Westbourne Terrace. W.

1890 Rouw, R. Wynne, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. Eng. 7, Wimpole Street. W.

1894 Rowe, Henry Burbery, L.D.S.Eng. 7, Cavendish Square. W.

1888 Royston, Jonathan, L.D.S.Eng. Oakfield, Huyton, near Liverpool.

1892 Rushton, Wm., L.D.S.Eng. 32, Harley Street. W.

Elected

1888 Rymer, J. F., M.R.C.S.Eng., L.D.S.Eng. 13, Old Steine, Brighton.

1863 Rymer, S. L., L.D.S.Eng. Pevensey, Wellesley Road, Croydon. (C. 1864.65.66.67. V.P. 1868.69.81. P. 1882.)

1878 Sanders, J. J. H., L.D.S.Irel. The Square, Barnstaple.

1894 Sansom, William Bertram, L.D.S.Eng., D.M.D.Harv. 34, Bruton Street. W.

1856 Saunders, Sir Edwin, F.R.C.S.Eng. Fairlawn, Wimbledon Common. S.W. (C. 1868.69.74.75.80.81.87.88. T. 1856.57.58.59.60. V.P. 1861.62.63. P. 1864 and 79). (Trustee.)

1878 Saunders, Walter, L.D.S.Irel., D.D.S.Phil. Memel House, Ramsgate.

1891 Schelling, Carl, L.D.S.Eng. 37, Cavendish Square, W.

1891 Seville, John William, L.D.S.Eng. 71, Sandgate Road, Folkestone.

1894 Sewill, Joseph Sefton, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. 9a, Cavendish Square. W.

1893 Shiach, Gordon Reid, L.D.S.Edin. 1, North Guildry Street, Elgin.

1888 Shillcock, Jos. W., L.D.S.Irel. 1, Rue Basse, Cannes, France, and 103, Park Street. W.

1877 Simmons, James J., L.D.S.Eng. 18, Burton Crescent. W.C.

1895 Simms, William, L.D.S.I. 2, Bury New Road, Manchester.

1895 Skipp, George Nash, L.D.S.Eng. Sale, Cheshire.

1864 Smale, H. C., L.D.S.Eng. 118, Oxford Street, Manchester.

1880 Smale, Morton A., M.R.C.S.Eng., L.S.A., L.D.S.Eng. 22a, Cavendish Square. W. (C. 1885.86.87.92. V.P. 1893.)

1883 Smith, Alfred, L.D.S.Eng. 52, Parkhurst Road, Holloway. N. (C. 1895-96.)

1893 Smith, Arthur Hopewell, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. Lindum House, Boston, Lincolnshire.

Elected

1893 Smith, Ed. F., L.D.S.Eng. 176, Brixton Road. S.W.

1858 Smith, George W., M.R.C.S.Eng., L.D.S.Eng. 6, Aytoun Street, Manchester. (C. 1874-75.)

1863 Smith, J. A., L.D.S.Eng. 26, Eaton Terrace. S.W.

1892 Smith, J. Percy, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. Eng. 26, Eaton Terrace. S.W.

1889 Spokes, Sidney, M.R.C.S.Eng., L.D.S.Eng. and Edin. 59, Queen Anne Street, Cavendish Square. W. (C. 1895.96.)

1884 Stack, Richard Theo., M.D.Dub., F.R.C.S.Irel., L.R.C.S. Edin., L.D.S.Eng., D.M.D.Harvard. 10, Westland Row, Dublin. (C. 1889.90. V.P. 1891.92.93.)

1882 Sternfeld, Alfred D., M.D. 3, Karlstrasse, Munich.

1888 Stevens, Alfred, L.D.S.Edin. and Irel. 11, Park Road, Clapham. S.W.

1893 Stevens, Herbert John, L.D.S.Eng. Pendeen, 77, Stamford Hill. N.

1873 Stevens, Mordaunt, M.R.C.S.Eng., L.D.S.Eng., M.D. Phil., D.D.S.Phil. Villa Corinaldi, Place Grimaldi, Nice, France. (C. 1890.91.92.)

1893 Stewart, James, L.D.S.Edin. 19, Princes Street, Perth, N.B.

1895 Stocken, Leslie Maury, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S. 55, Uxbridge Road, Ealing. W.

1893 Stoner, Harold, L.D.S.Eng. 18, Regency Square, Brighton.

1886 Storey, J. Charles, L.D.S.Irel. Dunallan House, Hull.

1893 Sutcliffe, Charles Frederick, L.D.S.Irel. 15, Victoria Terrace, South Shields.

1877 Swanson, A. J., L.D.S.Eng. 112, Cheapside. E.C.

1892 Thomson, David, L.D.S.Edin. 15, Great Marlborough Street. W.

1894 Thomson, George, L.D.S.Eng. 4, Park Place, Torquay.

1881 Thomson, W. Scott, M.R.C.S.Eng., L.D.S.Eng. c/o G. B. Cave, Esq., 14, Finsbury Circus. E.C. (C. 1889.90.)

Elected

1871 Tippett, J. Collins. 14, Belgrave Terrace, Torquay.

1893 Tisdall, Charles J., L.D.S.Eng. 2, Heathfield Road, Acton. W.

1870 Tomes, Charles S., F.R.S., M.A.Oxon., M.R.C.S.Eng., L.D.S.Eng. 37, Cavendish Square. W. (C. 1884.85. 89.90.91. Curator 1870.71.72.73.74.75.76.77.78.79.80. V.P. 1881.82.83. P. 1887.)

1856 Tomes, Sir John, F.R.S., F.R.C.S.Eng., L.D.S,Eng. Upwood Gorse, Caterham Valley, Surrey. (C. 1864. 66.67.70.71.72. H.S. 1856.57.58. V.P. 1859.60.61. P. 1862 and 75.)

1886 Tracy, Humphrey W., L.D.S.Edin. 6, Hatter Street, Bury St. Edmunds.

1893 Trollope, William Thomas, L.D.S.Irel. High Street, Tunbridge Wells, and 17, Upper Wimpole Street. W.

1881 Truman, Chas. E., M.A.Camb., M.R.C.S.Eng., L.D.S.Eng. 23, Old Burlington Street. W. (C. 1893.94.95.96.)

1867 Turner, J. S., M.R.C.S.Eng., L.D.S.Eng. 12, George Street, Hanover Square. W. (C. 1873.74.78.79.80.83. 88. H.S. 1875.76.77. V.P. 1881.82. P. 1884.)

1879 Underwood, Arthur, M.R.C.S.Eng., L.D.S.Eng. 26, Wimpole Street. W. (C. 1885.86.93.94.95.)

1869 Van der Pant, F. J., L.D.S.Irel. Elm Lawn, Kingston-on-Thames. (C. 1889.90.)

1894 Vice, William Armston, M.B., C.M.Aber., L.D.S.Edin., D.D.S.Phil. 5, Belvoir Street, Leicester.

1860 Walker, Joseph, M.D. St.And., M.R.C.S.Eng., L.D.S. Eng. 22, Grosvenor Street. W. (C. 1868.69.70.79. 82. Ed. Trans. V.P. 1880.81. P. 1883.)

1892 Waller, Robert Edward, L.D.S.Eng. Cairo, Egypt.

1874 Wallis, C. J. Boyd, L.D.S.Eng. 23, Brook Street. W. (C. 1886.90.91.92. H.F.S. 1887. H.S. 1888.89. V.P. 1895.96.)

Elected

1868 Wallis, George, L.S.D.Eng. 54, Wimpole Street. W. (C. 1880.81.)

1876 Washbourne, E. Norman, L.D.S.Eng. 17, Fountains Terrace, Ripon.

1888 Watson, George W., L.D.S.Edin. 3, Walker Street, Edinburgh.

1892 Webster, Percy L., L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng. 26, Welbeck Street. W.

1881 Weiss, F. Henri, L.D.S.Eng. 7, Cavendish Square, W. (H.F.S. 1891.92.)

1881 Weiss, Willoughby, L.D.S.Eng. 7, Cavendish Square. W. (C. 1889.90.91. H.F.S. 1886. H.S. 1887.88.)

1874 Wells, John, L.D.S.Irel. 4, Athenæum Terrace, Plymouth.

1863 West, C., L.D.S.Eng. 41, Finsbury Square, E.C. (C. 1876.77.)

1893 Weston, Ernest, L.D.S.Eng. High Street, Ventnor, Isle of Wight.

1876 Whatford, J. Henry, L.D.S.Eng. Elms Lea, 6, Seaside Road, Eastbourne. (C. 1885.86.87.)

1892 Wheatley, William Henry, L.D.S.Eng. and Glas. 120, Harley Street. W.

1880 White, Edward A., M.D., C.M.Aber., L.S.A.Lond., L.D.S.Edin. 1, Highbury Place. N.

1876 White, R. Wentworth, M.R.C.S.Eng., L.D.S.Eng. 26, St. Giles's Street, Norwich. (C. 1888.89.)

1870 White, T. Charters, M.R.C.S.Eng., L.D.S.Eng. 26, Belgrave Road. S.W. (C. 1874.75.80.81.82. V.P. 1884.85. P. 1886.)

1891 Whittaker, Geo. Oldham, L.D.S.Eng. King's Chambers, 26, King Street, Manchester.

1894 Whittles, John Dencer, L.D.S.Eng. 17, Summer Row, Birmingham.

1888 Williams, Hugh Lloyd, M.R.C.S.Eng., L.D.S.Eng. 2, Upper Wimpole Street. W.

Elected

1881 Williamson, W. H., M.D.Aber., L.D.S.Edin., D.D.S.Phil. 15, Union Terrace, Aberdeen. (C. 1892.93.)

1874 Wilson, Andrew, L.D.S.Edin. 2, North Charlotte Street, Edinburgh. (C. 1883.84. V.P. 1885.86.87.)

1864 Wilson, G., L.D.S.Irel. 4, Whitefriar Gate, Hull.

1876 Winterbottom, Augustus, F.R.C.S.Eng., L.D.S.Eng. 16, Sloane Street. S.W. (C. 1884.85.86.)

1889 Winterbottom, Charles, M.R.C.S.Eng., L.D.S.Eng. 16, Sloane Street. S.W.

1875 Wood, Maurice D., L.D.S.Irel. Whitehall Place, Stockton-on-Tees.

1890 Wood, R. Ernest, L.D.S.Eng. 12, Princes Square, Harrogate.

1894 Wood, Walter R., L.D.S.Eng. 21, Old Steine, Brighton.

1878 Woodburn, James C., M.D.Glas., L.F.P.S.Glas. 197, Bath Street, Glasgow.

1863 Woodburn, W. S., L.D.S.Glas. 17, Carlton Place, Glasgow. (C. 1891.92.93.)

1894 Woodcock, Richard Ernest, L.D.S.Eng. Gillygate House, Pontefract, Yorkshire.

1886 Woodhouse, A. Clayton, M.R.C.S.Eng., L.D.S.Eng. 1, Hanover Square. W. (H.F.S. 1894-95. H.S. 1895-96.)

1856 Woodhouse, Alfred J., L.D.S.Eng. 1, Hanover Square. W. (C. 1867.68.79. V.P. 1877.78. P. 1880.) (Trustee.)

1876 Woodhouse, Robert H., M.R.C.S.Eng., L.S.A., L.D.S. Eng. 1, Hanover Square. W. (C. 1888.89.90. H.F.S. 1884. H.S. 1885.86.87. V.P. 1892.93.94.95.)

1879 Woodruff, William Herbert, L.D.S.Eng. 13, New Burlington Street. W. (C. 1889.90.91.)

1878 Woods, W. T. 25, Chowringhee, Calcutta, India.

1892 Woolf, Michael Y., L.D.S.Eng. 1, Marlborough Place, St. John's Wood. N.W.

1870 Worsley, John. 7, Fishergate Hill, Preston.

Elected

1892 Wrighton, Thomas Henry Garland, L.D.S.Eng. 7, Bloomsbury Square. W.C.

1883 Yates, Sydney Greatrex. Berkeley House, Ross, Hereford.

1863 Zinkgraf, F., L.D.S.Eng. 30, Romerstrasse, Durkheim an der Haardt Rhine, Bavaria.

Honorary Members	...	...	...	...	22
Corresponding ,,	...	...	...	...	10
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June, 1895.

List of Members.

Arranged under the heads of the Cities, Towns, &c., in which they reside.

Aberdeen.

De Lessert, A. A.
Williamson, W. H.

America.

Bogue, Edward A., New York City.
Cook, C. D., Brooklyn. (Corresponding.)
Jarvie, W., Brooklyn.
Meriam, Horatio C., Salem, Mass., U.S.A. (Corresponding.)
Stellwagen, Thomas C., Philadelphia. (Corresponding.)

Australia.

Belisario, John, Sydney. (Corresponding.)
Crank, Peter, Adelaide.
Paterson, Hugh, Sydney.
Reading, Edward, Sydney.
Reading, Philip Burdett, Sydney.
Reading, Richard Fairfax, Sydney.

Barnstaple.

Sanders, J. J. H.

Bavaria.

Zinkgraf, F., Burkheim an der Haardt Rhine.

Bedford.

Kirby, Alex.

Berlin.

Miller, W. D. (Corresponding.)

Belfast.

Andrew, John James.

Birkenhead.

Mansell, Thomas.

Birmingham.

English, T. R. M.
Huxley, F. Earle.
Neale, W. Breward.
Richards, F. W.
Whittles, J. D.

Boston (Lincolnshire).

Smith, A. H.

Bournemouth.

Hogue, Wilson.
Merson, William.
Payne, Arthur G.

Bradford.

Matthews, A. Alexander.

Brighton.

Dennant, J.
Harrison, Walter.
Redman, J. H.
Rymer, J. F.
Stoner, Harold.
Wood, W. R.

Bristol.
Ackland, William R.
Hayman, C. A.

Bromley.
Apthorpe, S. R.

Bury St. Edmunds.
Tracy, Humphrey W.

Cambridge.
Cunningham, George.
Rhodes, W. A.

Canada.
Beers, W. G., Montreal (Corresponding).

Canterbury.
Bell, Martin Luther.

Carlisle.
Hele, Warwick.

Caterham.
Fletcher, T. B. (Honorary.)
Tomes, Sir John.

Cheltenham.
Fernald, H. P.
Rogers, R.

Croydon.
Hughes, Morgan.
Rymer, S. L.

Darlington.
Fothergill, J. A.

Derby.
Morley, Henry.

Dewsbury.
Margetson, W. E.

Dublin.
Baker, A. W. W.
Bloom, Marcus J., Jun.
Corbett, Daniel.
Corbett, Daniel, Jun.
Stack, Richard Theo.

Dundee.
Campbell, Walter.

Eastbourne.
Foran, J. C.
Herschell, R.
Whatford, J. Henry.

Edinburgh.
Amoore, J. Spencer.
Durward, J. S.
Hepburn, David. (Honorary.)
Macgregor, Malcolm.
Macleod, William B.
Matthew, Charles.
Orphoot, Peter.
Watson, George W.
Wilson, Andrew.

Egypt.
Waller, Robert Ed., Cairo.

Elgin.
Shiach, G. R.

Epsom.
Keeling, G. R.

Exeter.
Ackland, J. McKno.
Browne-Mason, J. T.
Goodman, W. H.
Mason, Henry B.
Mundell, Stephen.

Folkestone.
Henry, Martin.
Seville, J. W.

France.
Blain, E. J., Lyons.
Darin, C., Meudon. (Corresponding.)
Evans, Thos. Wm., Paris. (Corresponding.)
Magitot, E., Paris. (Corresponding.)
Manton, E. A., Boulogne.
Poinsot, P. H. V., Paris.

Shillcock, Jos. W., Cannes (and London).
Stevens, Mordaunt, Nice.

Glasgow.

Agnew, Joseph.
Brownlie, J. R.
Fergus, Oswald.
Price, Rees.
Woodburn, James C.
Woodburn, W. S.

Great Grimsby.

Howkins, T. M.

Guildford.

Hope, A. C.
Hope, H. L. C.

Guernsey.

Hugo, George Joseph.
Hugo, Samuel George Joseph.

Hanley.

Baines, A.

Harrogate.

Martin, Gavin W.
Wood, R. E.

Hastings.

Henry, George.

Hereford.

Levason, Arthur G.
Levason, Peyton Grenville.
McAdam, George C.

Hull.

Storey, J. Charles.
Wilson, G.

Hungary.

Arkövy, Dr. T., Budapest.

India.

Clerk, Smollett W., Madras.
Davar, F. E., Bombay.
O'Meara, Alfred, Simla.
Woods, W. T., Calcutta.

Inverness.

Fraser, J. L.
Nash, F. L.

Ipswich.

Cole, J. F.

Isle of Man.

Karran, J., Douglas.

Italy.

Atkinson, S., Commre., Naples.
Dunn, C. W., Florence (Honorary.)
Martini, Luigi, Turin.

Jersey.

Balcomb, Thos.

Kingston-on-Thames.

Van der Pant, F. J.

Leamington.

Curle, Arthur.

Leeds.

Brunton, George.
Carter, T. S.
Leigh, P. T.
Nicol, J. M.

Leigh, Essex.

Murie, J. (Honorary).

Leicester.

McCall, John H.
Vice, W. A.

Liverpool.

Quinby, Henry Clay.
Quinby, Melville G. C.
Royston, Jonathan.

London.

Ackery, John.
Albert, Henry L.
Apperly, Ebenezer.

Apperly, Herbert.
Badcock, J. W.
Baker, A. E.
Bailey, G. H. (Honorary.)
Balding, Edmund, Jun.
Baldwin, Harry.
Baly, C. F. P.
Barnard, Alfred Geo. Wm.
Barrett, Ashley William.
Barrett, F. W.
Barrett, H. J. (Honorary.)
Bartlett, Edward.
Bateman, George William.
Beale, Lionel S. (Honorary.)
Bennett, Fred. Jos.
Bennett, Storer.
Betts, Ed. G.
Bird, Tom. (Honorary.)
Bonnell, Bentley J.
Braine, F. Woodhouse. (Honorary.)
Briault, E. H. L.
Brown, L.
Butcher, J. O.
Buxton, Dudley W. (Honorary.)
Canton, Frederick.
Canton, Fred Arthur.
Carteighe, John, Jun.
Cartwright, Alexander.
Clarence, J. H.
Clark, C. A.
Coffin, Walter.
Coleman, Alfred. (Honorary.)
Colyer, Arthur R.
Colyer, J. F.
Cook, Stanley.
Corbett, J. F.
Cotterell, Chas. Vincent.
Curnock, George Dennis.
Davis, Charles D.
Davis, Henry.
Davis, Marcus John.
Davis, Murray.
Densham, A. B.
Dewes, Hugh William.
Dowsett, George Harris.
Edgelow, J. Percy.
England, W. J.
Ewbank, Francis.
Fairbank, John.
Farmer, F. H.
Field, W. George.
Flower, Sir William. (Honorary.)
Forsyth, Harry A.
Forsyth, W. F.
Freeman, J. R.
Gabell, D. P.
Gabell, Ernest.
Gardner, Ernest.
Gartley, John A.
Gibbings, Ashley.
Gill, H. B.
Gould, H. J.
Greenfield, J.
Gregson, G.
Hall, E. C. J.
Halliday, Middleton W.
Handley, C. W. Croft.
Handley, J. T.
Harding, Milward.
Harding, T. Henry G.
Harris, A. Carpenter.
Harris, J. E.
Harris, T. W.
Harrison, Philip.
Harrison, Richard.
Heath, Christopher (Honorary.)
Henly, A. W.
Henry, P. F.
Hepburn, David.
Hepburn, Robert. (Honorary.)
Hern, George.
Hern, William.
Holford, W. Stanley.
Hope, J. L.
Hopson, Montagu F.
Humby, W. R.
Hutchinson, S. J.
Imrie, William. (Honorary.)
Kendall, W. H.
Kissack, Frank H.
Kluht, Henry J.
Lloyd-Williams, E.
Longhurst, Henry Bell.
Lucas, George J.

Maggs, W. A.
Mansbridge, Josiah.
Matheson, Leonard.
May, Percy.
May, W. J.
Merson, James.
Messenger, Henry W.
Mitchell, F. W.
Mitchell, Wm.
Morley, Frank.
Mummery, John Howard.
Newland-Pedley, F.
Newton, Fredk. Harriss.
Noble, Chas. J.
Northcroft, George.
Paget, Sir James. (Honorary.)
Pare, J. W.
Parkinson, Herbert S.
Parks, William J.
Paterson, W. Bromfield.
Pedley, George.
Pedley, R. Denison.
Penfold, W.
Pillin, H. L.
Porter, W. P.
Pratt, R. J. H.
Preedy, E. J.
Price, Rhys.
Read, Henry G.
Read, Thomas.
Read, Thomas George.
Reinhardt, J. H.
Richardson, Sir B. (Honorary.)
Rilot, Charles F.
Robbins, Cornelius.
Roberts, Charles Alfred.
Rogers, Claude.
Rogers, Henry.
Rogers, Thomas Arnold.
Rooke, F. J. F.
Rose, Harry.
Roughton, Edmund W.
Rouw, Robt. Wynne.
Rowe, H. B.
Rushton, Wm.
Sansom, W. B.
Saunders, Sir Edwin.
Schelling, Carl.
Sewill, J. S.
Shillcock, J. W.
Simmons, James J.
Smale, Morton A.
Smith, Alfred.
Smith, E. F.
Smith, J. A.
Smith, J. Percy.
Spokes, Sidney.
Stevens, Alfred.
Stevens, H. J.
Stocken, James. (Honorary.)
Stocken, Leslie Maury.
Sutton, John B. (Honorary.)
Swanson, A. J.
Thomson, David.
Thomson, W. Scott.
Tisdall, C. J.
Tomes, Charles S.
Trollope, W. T.
Truman, Charles E.
Turner, J. S.
Underwood, Arthur S.
Underwood, Thomas (Honorary.)
Walker, Joseph.
Wallis C. J. Boyd.
Wallis, George.
Webster, Percy L.
Weiss, F. Henri.
Weiss, Willoughby.
West, C.
Wheatley, William Henry.
White, Edward A.
White, T. Charters.
Williams, H. Lloyd.
Winterbottom, Augustus.
Winterbottom, Charles.
Woodhouse, A. Clayton.
Woodhouse, Alfred J.
Woodhouse, Robert H.
Woodruff, William Herbert.
Woolf, Michael Y.
Wrighton, Thos. H. Garland.

Macclesfield.

Bates, W.

Maidenhead.

Ghrimes, S. (Honorary.)

Pallant, Arthur.

Manchester.
Campion, Geo. G.
Campion, H.
Farnsworth, Charles.
Simms, William.
Smale, H. C.
Smith, George W.
Whittaker, Geo. O.

Munich.
Sternfeld, Alfred D.

Newark.
King, R. F. H.

Newbury.
Mallet, Gilbert.

Newcastle-on-Tyne.
Fothergill, Edward.
Markham, R. L.
Moon, Wm. Draper.

New Zealand.
Cox, Edwin, Auckland.
Robinson, George, Oamaru.

Northfleet.
Lucas, George (and London).

Norwich.
Bridgman, J. B.
Mackley, E. H. A.
White, R. Wentworth.

Nottingham.
Bellaby, G. W.
Goddard, H. E.
Porter, F. C.

Oxford.
Bevers, E. A.

Perth.
Stewart, James.

Peterborough.
Palmer, James Edwin.

Pontefract.
Woodcock, R. E.

Plymouth.
Balkwill, F. H.
Jewers, Ernest E.
Wells, John.

Portsmouth.
Austen, L. G.
Baker, Alfred J.
Martin, J. H. C.

Preston.
Worsley, John.

Ramsgate.
Saunders, Walter.

Reading.
Knowles, Vernon.

Redhill, Surrey.
Ellwood, F. Henry.

Rhyl.
Coles, E. V.

Richmond, Surrey.
Davis, Harry.
Richards, George Oliver.

Ripon.
Washbourne, E. Norman.

Ross, Hereford.
Yates, Sidney Greatrex.

Rugby.
Haynes, Fredk.

Salisbury.
Farebrother, H. Lloyd.
Farebrother, W. Aubrey.

Sale.
Skipp, G. N.

Scarborough.
Grayston, William Cass.
Mason, Charles Browne.

Sheffield.
Pike, J. L. F.

Shrewsbury.
Harding, Wm. E.

South Molton.
Oram, C. H.
Merson, Frank.

Southsea.
Cornelius-Wheeler, J.

Southport.
Evans, A. J. G.

South Shields.
Sutcliffe, C. F.

St. Leonards.
Amoore, D. W.
Dickinson, M. de C.

Stirling.
Platt, Leon J.

Stockton-on-Tees.
Wood, Maurice D.

Stroud.
Apperly, Ebenezer (and London).

Surbiton.
James, W. E.
Mellersh, W. F.

Switzerland.
Kölliker, Paul Alfred, Zurich. (Corresponding.)

Taunton.
Kendrick, Alfred.

Tonbridge.
Coles, J. Oakley. (Honorary.)

Torquay.
Tippett, J. Collins.
Thomson, George.

Truro.
Bullen, H. E.

Tunbridge Wells.
Bacon, W. Beadell.
Trollope, Wm. Thos. (and London).

Ventnor.
Weston, Ernest.

Walton-on-Thames.
Power, Thos. Henry.

Watford.
Fisk, W. J.

West Kirby.
Matthews, Wm.

Weybridge.
Flintan, F. R.

Wisbech.
Coxon, Stephen A.

Worthing.
Cooksey, E. T.

Yarmouth, Gt.
Cobb, John S.

Yeovil.
Hunt, William A.

York.
Glaisby, Walter.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

November 5, 1894.

Mr. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

President, in the Chair.

The Minutes of the last meeting were read and confirmed.

The following nominations having been approved by Council, were proposed to meeting:—John William Pare, M.D., C.M.Edin., L.D.S.Eng., 18, Portland Road, W. (resident); F. E. Davar, L.D.S.I., Church Gate Street, Fort Bombay, India (non-resident).

Obligation forms duly signed were read at the meeting, as having been received from the following:—Messrs. Charles S. Hull, Walter R. Wood, R. Woodcock.

The following signed the obligation book, and were formally admitted as members:—Messrs. P. Harrison, J. W. Shilcock, W. F. Mellersh, J. D. Whittles, H. B. Rowe.

The Curator announced the presentation of various preparations to the Museum during the recess.

Mr. Frank Merson (of South Molton) sent an upper incisor, removed from a young man aged 19, showing very considerable absorption of the root of the tooth, which was only about $\frac{1}{4}$ in. in length. Also a lower wisdom tooth

removed from a lady aged 40. This tooth had caused a great deal of pain for some years, and eventually with some difficulty was removed. It appeared that the tooth was never erupted, but it was extracted without injury resulting to the second molar in front.

An analogous specimen to the one just mentioned was sent by Mr. Pidgeon, one of the students at the Hospital. It was the left upper central incisor of a girl aged 22. In clearing the pulp canal he came upon soft, sensitive, vascular material, evidently situated at the end of a very short canal. On extracting the tooth, the root was found to be only about $\frac{1}{4}$ in. in length.

Mr. Herbert Bowtell, a former student, sent the skull of a Maori, an aboriginal inhabitant of New Zealand. The teeth were very much worn by attrition, many were absent altogether, and had evidently long been lost. The teeth in front were very much worn through the loss of the back ones. The pulps of the remaining incisors and canines had all been exposed during life and there had been alveolar abscesses connected with them. The Society was much indebted to the donor for this specimen.

The right half of the mandible of a cat, presented by a student of the Dental Hospital of London, showed as beautifully as any specimen he (Mr. Storer Bennett) had ever met with, the formation of a vaginal sheath enclosing dead bone. There was a very large sequestrum in the molar region, surrounded with extremely vascular porous bone—very thick indeed. It showed extremely well the method by which dead bone was enclosed by the new bone deposited around it. The examination of a preparation in the Museum, which he (Mr. Bennett) made some years ago, to show the dentition of the cat, when placed side by side with this specimen, would enable them to appreciate more readily the enormous amount of new bone formation which had taken place.

Mr. Morton Smale had sent three mandibles, together with a long and interesting description. As they had only just been received, and there were several points of interest, he (Mr. Storer Bennett) proposed to reserve any comments till the next meeting.

Mr. Smale said :—

"I send three examples of the mandible of the hog; the other part of the skull is not forthcoming. As far as I can ascertain they are probably from the common domesticated pig, and not, as probably will be surmised, examples of the hog whose upper tusks had been removed in order that the lower ones may be allowed to grow into a circle and be worn as a decoration or charm.

"The smallest one is evidently that of a young pig, and the tusk has grown in such a position that it resembles rather the curve taken by the lower tusk of the Sus Babirussa.

"The next one in size shows the tusks taking an unusual curve; they would probably ultimately have pierced the flesh and entered the bone.

"The large one is similar but more marked, and in addition shows, on the right side, a radicular odontome. On the left side the tusk has pierced the flesh and wedged itself between two molars and occasioned some considerable amount of inflammatory trouble, causing the fangs of the last molar to be partially absorbed. The mandible evidently belonged to an old hog, and consequently it cannot be said that the more anterior molar had been lost in consequence of the position of the tusk, but it seems very probable. Mastication has been performed on the other side, as is shown by the wear on that side, and the tuberculate condition of the last molar on the left side.

"Without further history, which I cannot obtain, it must be surmised that the upper tusks in the animal (to which these mandibles belong) had been broked or removed."

An extremely interesting preparation had also been sent by Mr. Frank Merson, of South Molton, showing the enormous amount of damage that might be done to animals which had met with an accident, where the pulps of certain teeth were of persistent growth. It was the skull of a hare, and showed that the mandible had been fractured—evidently long prior to death—vertically, between the second and third molars. The result was, the antagonism of the teeth was imperfect, and the right lower incisor had grown to double

the length of the upper one. He (Mr. Bennett) had brought from the Museum a preparation of a normal skull of a rabbit, which was practically the same as that of the hare, for purposes of comparison. The two upper incisors had both been deflected very much to the left side, the right incisor entering the cheek, and although the whole of the soft tissue had not been removed, the tooth had probably pierced the bone. The preparation was sent with all the skin and soft tissues attached, and a good deal of muscle was still left in position so that members might see the immense amount of damage done to the soft parts as well as to the bone. The molars in the mandible on the right side were very curiously abnormally placed in consequence of the attrition which was never after the accident anything like normal. The jaw could only be slid from the left side towards the right; the result was the first molar had been diverted backward, the second molar passed directly upwards in the normal position, and the third and fourth molars were directed forward, the upper molars biting upon the distal and lingual surfaces of the teeth. This produced a distinct interlacing of the teeth in a most remarkable manner. The normal height of the teeth would be from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch, but these lower molars on the right side were erupted to the extent of $\frac{3}{8}$ of an inch. The rims were worn in such a way as to indicate evidently that the mastication was not an up-and-down one, nor an ordinary transverse one, but simply a sliding of the molars from the left side to the right, for the outer sides of the right upper molars had worn away, and the inner sides remained long, whereas on the left side the inner sides were worn away, and the outer sides remained long. On looking at the under side of the mandible it would be seen how very much stunted was the development of bone on the right side compared with the left, the two sides being symmetrical. He proposed to remove the remaining soft tissues and show the bone with the teeth fully displayed, but thought it would be interesting first of all to exhibit the skull with some of the soft part remaining, to show the immense amount of ulceration that had taken place. Not only had the left

upper incisor ulcerated into the cheek, but the tooth on the opposite side had also ulcerated into the cheek on its own side, so that ulceration had taken place on both sides of the mouth. The Society was deeply indebted to Mr. Merson for the three preparations he had presented.

The LIBRARIAN reported that the following books had been added to the Library :—Tomes' "Dental Anatomy," fourth edition, Heath's "Injuries and Diseases of the Jaws," fourth edition; also that he had received, in addition to the usual Journals and Periodicals, *Guy's Hospital Reports for* 1893, *Report of the Smithsonian Institution for* 1892, and *The Lancet*, in exchange. He mentioned that the Council had decided to open the Library during the coming year on Monday, Wednesday and Friday evenings, in continuance of the present arrangements.

The PRESIDENT announced with great regret the death of a very old member, Mr. Ibbetson, who was President in 1867.

They proposed that evening to slightly depart from the usual course. There was no paper, and instead of filling up the evening with casual communications it was thought it might be agreeable to members to hold a kind of conversational evening, more especially as it was their first meeting after the holidays. Before closing the more formal proceedings he wished to thank very much all those gentlemen who had kindly assisted in bringing forward microscopical specimens, and also those who had made such very handsome contributions to the museum.

Mr. H. G. READ showed a patient, a boy 4 years and 7 months old, exhibiting a very marked condition of hypertrophy, probably of both bone and fibrous tissue in the upper and lower jaws. The condition was especially pronounced in those regions of the mouth corresponding with the positions of teeth only partially erupted. There was a slight beading of the ribs and the boy's aspect generally indicated a rickety condition.

Mr. W. R. HUMBY showed a special hollow tray fitted with inlet and outlet tubes for irrigation by cold water for

rapidly cooling composition in taking impressions of the mouth. The irrigation was carried out by means of tubing attached to a suspended tank filled with iced water. Mr. Humby claimed that the time occupied in taking an impression was reduced to one-fifth of that usually necessary, and that nauseation in taking full impressions was considerably lessened.

Dr. Joseph Walker showed a mouth mirror with an electric thermal attachment by means of which a moderate quantity of warmth is applied to the back of the mirror, obviating the condensation of moisture when held in the mouth. The current was supplied from a Pilkin's two-volt secondary battery.

Mr. Geo. Brunton showed a new quick-setting amalgam, called "Nurium," said to be composed of three-fifths of gold and silver. The amalgam was marked by rapid setting, good colour and hardness.

Mr. C. Robbins showed a method of hardening the surface and defining the edges of amalgam fillings by wiping over with the ends of Wolrab gold cylinders.

Mr. C. S. Tomes exhibited various microscopic sections, comprising:—

(1) Section of vaso-dentine from the hake, vascular canal showing the fissure-like canals running from the sides.

(2) Outer layer of dentine of cod, illustrating a connective tissue calcified with little change from its original aspect.

(3) Dentine of sargus near the base of the tooth.

(4) Cross sections of tooth and pulp of the ling, showing the connective tissue layer formerly wrongly described as an odontoblast layer.

(5) Connective tissue fibrils devoid of nuclei, which form in a definite layer the surface of the pulp of a hake.

(6) Section of dentine of hake, showing the tendency to split up in long lines corresponding to the connective tissue formative fibres.

(7) Lamination to be distinguished in vaso-dentine when fully formed and not decalcified, parallel to its surface, and there fore at right angles to the fibrils shown.

(8) Vascular canals of the dentine of the manatee, probably vestigial, resembling a number of interglobular spaces arranged in lines.

(9) Enamel of the sargus decalcified by chromic acid.

(10) Transverse section of outer layer of dentine of cod, in which some rods are seen in cross section. The appearance has not been adequately explained.

(11) Developing tooth of the sargus showing the continuation of its pulp with the odontoblast layer within what was apparently a hollow bony pedestal.

Mr. Mummery showed: (1) A section of odontoblast layer of human tooth—iron and tannin impregnation method; also (2) Absorbent organ of temporary tooth showing giant cells; (3) Nerve bundles in the pulp—iron and tannin impregnation process.

Mr. Hopewell Smith exhibited a section showing round cell sarcoma in connection with the peridental membrane of upper molars.

Mr. Campion showed specimens of pulp with well-marked presence of micro-organisms.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

December 3, 1894.

MR. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

PRESIDENT, IN THE CHAIR.

THE Minutes of the last meeting were read and confirmed.

The following gentlemen were balloted for and elected members of the Society:—ASHLEY BLOOMFIELD DENSHAM, L.R.C.P., M.R.C.S., L.D.S.Eng., 18, Stratford Place, W. (resident); GEORGE THOMSON, L.D.S.Eng., 4, Park Place, Torquay (non-resident).

The following nominations were proposed to the Society for non-resident membership:—ERNEST H. A. MACKLEY, L.D.S.Eng., 74, St. Giles Street, Norwich; THOMAS L. NASH, L.D.S.Edin., 39, Church Street, Inverness; WILLIAM SIMMS, L.D.S.I., 2, Bury New Road, Manchester.

The LIBRARIAN said he had only to report that the ordinary periodicals and journals had been received.

The CURATOR stated that he had received from Mr. E. Shillcock, of Neue, three tiny single-rooted conical teeth,

which were removed from between the second upper bicuspid and first molar of a young woman 18 years of age. The molar had been subject to periostitis for three or four years, but these supernumerary teeth nevertheless were quite firm.

Mr. Sefton Sewill showed a set of forceps which had been made for him with French lock joints. He thought that forceps were the instruments which ought—of all others—to be aseptic, but which, as ordinarily made, were extremely difficult to keep thoroughly clean. He had found those now exhibited satisfactory in every way, as each pair could be easily taken to pieces and effectively cleansed.

Mr. R. H. Woodhouse suggested that the forceps exhibited by Mr. Sewill were open to the serious objection that they would be very liable to catch the lip in the joint. After all, in using forceps it was not so important that the joint should be disinfected as the blade.

Mr. W. Hern showed an instrument he had devised for grasping and removing broken pivot pins from roots. He said that in the case of a pivot breaking off short in a root a considerable amount of labour was caused, and a good deal of time had to be expended in getting out the pin. The instrument now exhibited he considered a useful one. It consisted of two bi-concave tapering jaws or blades, controlled by a screw with an ordinary cone bearing point. When the screw was worked it approximated the jaws, and there was a good deal of force at command. He showed also two small trephines, one just pin size, and the other just over pin size, for use in the dental engine, and suggested their use for trephining around the pin, instead of the small fissure bur commonly employed for this purpose, as being a safer and readier method of loosening the pin and giving a grip to the instrument used for its removal.

He also exhibited a somewhat similar instrument with a small mechanical appliance for removing parts of a flexible drill or dressing broach which might be broken off in the canal. The contracted nature of the situation prevented the use of anything like a crocodile jaw, or any widely opening instrument. He had, therefore, devised an instru-

ment much on the same lines as the previous one, the jaws of which were controlled by a sliding tube. The instrument could be made either straight or oblique as required.

Mr. C. Robbins mentioned a case of reunited fracture of the maxilla, which came under his notice in the early part of the year. The patient was a gentleman who had been farming in Canada. He was about to visit England, when, returning from his ranche some fifty miles away from his home, the part of the vehicle upon which his feet were resting gave way, and he found himself between the hind quarters of the horse and the vehicle and then underneath the car, fixed in and at the mercy of the horse's hoofs for some time. Eventually the wood-work broke away and he was released from his perilous position. Fortunately, the horse was not shod or the results would have been very serious. The horse returning to the stables, they knew something was wrong, and returning along the road, the man was found in an insensible condition. The bleeding had somewhat stopped, but his head was very much knocked about, his cheek ripped open, and the face cut open from the angle of the mouth to within an inch of the eye. The left upper lateral and canine were missing. The maxilla was fractured from about the canine region, and the fractured third of the jaw containing the two bicuspids and three molars was dislocated, as far as he could understand, outwards and backwards. The extreme cold had stopped the bleeding. They drove him rapidly to the nearest railway station, fifteen miles off, and thence he continued his journey by rail. Fortunately he got into the hands of an able Scotch practitioner, who endeavoured to get the fractured part into position, at the first and second attempts unsuccessfully. Chloroform was suggested, but to this the patient objected. He had formerly been a medical student in Edinburgh and, unlike Scotchmen, had a great dread of chloroform. At the third attempt the fractured part was brought into position, as the patient described it, with a click. The face was stitched up, the chin bandaged, and recovery was speedy and satisfactory. He (Mr. Robbins)

saw the case about seven weeks after the occurrence, and took the model produced, which showed the condition of things when first he saw him. He advised waiting a few weeks and then put in an ordinary vulcanite plate with three teeth instead of the two, owing to the space being somewhat larger than before. The occlusion was thrown out by the elongation of the first bicuspid, but by judicious grinding of the cusps the bite was made normal. The case was interesting as showing that although so far away from central help, it was very well handled by the medical man on the spot, and things righted themselves quickly and well.

Mr. Robbins further related a case of fracture of the maxillary tuberosity. In November last year, a young lady, aged 25, came to him for the removal of the left upper wisdom tooth. The six-year-old molar was standing, but the twelve-year-old molar had been lost for some time, and the wisdom tooth was leaning forward. Gas was administered, and when she went well off, he endeavoured with a pair of bayonet stump forceps to remove the tooth. Having driven up, he began to dislocate, and at that moment there was sudden and unexpected opisthotonos. Finding that something more had given than he intended or desired he immediately released hold and found that a part of the alveolus had fractured, and severe ripping of the gum tissues had taken place. He allowed the patient to come round, explained as much as was necessary, and then found the gum so tenacious that he was compelled to dissect the tooth out of its membranous surroundings. Having done so, the tuberosity was easily picked away with forceps. He had now three large flaps to contend with; one split running into the soft palate, one on the buccal aspect, and a posterior flap almost involving the anterior pillar of the fauces. Going into his work-room he selected a model having a molar, as near as he could tell, the size of the six-year-old molar remaining in the mouth, and had hastily turned up a deep gold collar, on the posterior aspect of which was soldered a fish-tail flange of gold in a position just to clear the bite. In ten minutes he was able to get to his patient and to adjust the

collar on the molar, so that it went in with a spring. The flange of gold was heated and covered with gutta-percha to form the splint. The three flaps were collected together under his fingers; the collar was sprung on the molar, and it seemed to nestle nicely into place. Three days afterwards the splint was removed, when it was found that the healing process was going on well by first intention, except a small place in the palate which was healing by granulation. The splint was retained for a fortnight, when she returned, and the model was taken, which he now exhibited. An accident like that might occur to anyone, and he thought, therefore, he was justified in bringing the case before the Society. Since then he had adapted the same idea to a case of severe hæmorrhage, fitting a collar to the tooth and securing a gold flange, so as to keep the plug in place without interfering with occlusion.

Mr. F. J. Bennett asked Mr. Robbins if he came to the conclusion that it was absolutely necessary to remove the tuberosity, or whether it might have been possible to leave it, in the hope of its uniting again, and thus preventing any damage to the Eustachian tube or palate muscles. He had seen, unfortunately, cases where the tuberosity had been broken off, a condition which might occur to anyone, but in such cases seeing that the tooth pulp would be ruptured by the force, if it were possible to leave the tooth in place, there would be little risk of further aching, and it would act as a very good support on which to place a splint. From its vascularity the tuberosity would probably unite to the bone. When the palate was healed up the end of the mischief was not quite certain, because cicatrisation might draw upon the surrounding parts, and cause some damage to the sense of hearing or to the parts themselves.

Mr. Robbins said this unfortunate accident occurred twelve months ago. He had seen the patient recently, and she complained of no trouble whatever. It had not occurred to him to replace the tuberosity.

Mr. Maggs mentioned a case in which the tuberosity

had been distinctly moved out of place in an attempt to move an upper wisdom tooth. The operator recognised the difficulty; he helped him to replace it into position, and no further attempt was made to extract. The patient was an old lady. The case did very well and there was no hæmorrhage. She was seen several times afterwards, and there were no bad effects.

Mr. Baldwin said from an examination of the specimen produced by Mr. Robbins, it was obvious that the hamular process was not attached. The portion of tuberosity broken through was extremely small and evidently might have become united had it been left.

Mr. Frank Harrison mentioned a similar case, the results of which showed that it was better to remove any bone than to leave it.

Mr. W. Hern mentioned a similar case, in which fracture of the right upper maxilla occurred in an attempt to extract an upper molar tooth. The upper jaw was very much torn and lacerated, and there was a good deal of hæmorrhage, but in the result the case did perfectly well.

Orbito-Maxillary Diseases.

By W. J. Collins, M.D., M.S.Lond., F.R.C.S.

Although it is nearly four years since the first and last time I had the honour of addressing your Society, I retain at once a lively and pleasant recollection of that occasion. I spoke of "Associated and related Ocular and Dental Diseases," and although I had set down in a dull and prosaic fashion the results at which I had arrived, from a painstaking and not inconsiderable experience and subsequent reflection thereon, I was unduly surprised and not a little shocked, to hear in the discussion that followed, such dreadful terms as "iconoclastic" and "sceptical" invoked to describe my very modest conclusions. As the topic on which I speak to-night —one on which your specialty touches mine— that of "Orbito-Maxillary Diseases," is not wholly dissociated from that of my previous paper, perhaps I may be permitted to take up the thread of the narrative where that discussion left it, and in pursuing the matter I hope, by taking due warning from previous criticism, to

succeed in being more constructive and less destructive in what I have to say.

I have performed the painful task of reading through my paper of March, 1891, and looking at it in the light of the subsequent discussion, of maturer experience and of more recent literature, I am almost ashamed to admit that I have nothing to retract or withdraw, but am justified and corroborated in the position I advanced. I am, of course, in no way responsible for erroneous or misapprehended rendering of that position and, with your permission, I will briefly recite what it was.

I approached the consideration of associated and related ocular and dental diseases under two categories: (1) Those due to direct pathological sequence, of which antral abscess from dental caries and necrosis of the orbital plate with orbital cellulitis might be taken as a type, and (2) those due to indirect pathological sequence, almost necessarily nervous in mechanism, of which certain spasmodic affections of muscles of the eye might be regarded as typical. And my conclusion was thus stated:—"I am aware that while some regard all oculo-dental disorders with a wholesome scepticism, others are apt to concede to them an undue importance. I have attempted to decide justly between such extremes; I am led to emphasise the importance of orbital and ocular

troubles with direct pathological relation to dental diseases; to relegate to a less proven category reflex amaurosis and the like, while recognising the undoubted existence of certain reflex spasms and radiated neuralgiæ, which oculists must look to dentists to explain and cure."

Since I wrote this I have been busy four days a week for nearly four years, seeing ophthalmic patients in hospital together with private practice; I need hardly say I have kept my eyes open for reflex amauroses and reflex ocular paralyses, which should stand minute investigation. I have also looked out for such cases in medical literature, I have searched the volumes of the Ophthalmological Society, I have glanced through your own *Transactions*, and am forced to conclude that the position I maintained in 1891 still holds the field. I came across an interesting paper read by Dr. Maughan, before your Society, in February, 1893, and feel bound to allude to the facts he brought forward, so far as they touch the matter in hand; more especially as I find that my paper of '91 was alluded to by those who engaged in the subsequent debate. Dr. Maughan's paper was on "Remote Pain in Dental Disease," and he appears to cite two cases—and only two—of his own, both of which trench upon the question of reflex ocular effects arising from dental cause. Here are the cases verbatim:—

(1) "A patient complained of blurred vision in the right eye, and said it had lasted for upwards of twelve years. On examination the pupil was found dilated and irresponsive to light, thus indicating paralysis, temporary or permanent, of a few fibrils of the third nerve. On looking into the mouth a right upper molar was discovered carious; this was extracted, and three weeks later the pupil was normal and the sight perfect."

(2) "A woman, aged 45, slightly presbyopic in both eyes, came to the National Dental Hospital complaining of impaired vision in the right eye, and a painful first right upper bicuspid. On closer questioning, I found that her trouble was suddenly increased presbyopia in the right eye, and that if she closed her left, she could not accommodate her vision at all for near objects."

The offending tooth was removed, and the accommodation restored equal to the left. I gather that Dr. Maughan explains this case by the suggestion that the patient's centre for accommodation was getting tired out, and dental irritation further inhibited the flagging centre.

In the discussion which followed, Mr. Hunt regretted that I was not present (a regret I cordially share), as my arguments on a previous occasion "were not very convincing to him," though he kindly observed that my contribution was

"valuable, in that it made them look round for the ground of their faith, but remote pain in dental disease so frequently occurred, they must be cause and effect." Mr. Hunt, I must here remark, was tilting at a windmill which I had never attempted to set up; I recognised, nay, insisted upon, the "undoubted existence of certain reflex spasms and radiated neuralgiæ." Reflex amauroses and reflex ocular paralyses were the cases relegated to a less proven category, and for which I asked for unambiguous evidence. Though not present myself, in Mr. Albert I appear to have had a doughty champion, and I tender to him my grateful thanks. He was one of the unfortunate ones, he said, "who agreed with Dr. Collins." I would, however, bid him be of good cheer, as I have yet to learn that the position in which we agree has been seriously assailed. Do Dr. Maughan's two cases contradict my thesis? Although in the first case "blurred vision" was present for twelve years, and cured in three weeks by tooth extraction, I do not gather Dr. Maughan regards the case as one of reflex amaurosis, for in his reply he said:—"In connection with oculo-dental symptoms, he had paid a good deal of attention to one line of enquiry, viz., whether failure of sight could be traced to dental irritation; but hitherto he had never been able to obtain affirmative evidence."

With a view to clear up the nature of these two cases, I wrote to Dr. Maughan asking him if he could oblige me with the notes of the cases, or any further particulars. He replied he was sorry to say he had no notes of the patients referred to; he added he had searched in suggestive cases again and again for ophthalmoscopic changes, but hitherto with no success, and in a P.S. he added: "Since Feb. 1, 1893, I fancy my ideas have been very much modified on this subject." I will only remark that the pathology of presbyopia put forward by Dr. Maughan in connection with the second case, viz., failure of the centre, is not that which has been generally accepted from Donders downwards, and which refers the change to alterations in the shape and consistence of the lens, and numerous difficulties occur to me as precluding a reflex cycloplegia as the most probable explanation of either of Dr. Maughan's cases.

On the other hand, cases which are undeniable continue to accumulate, which establish the great importance of orbito-maxillary diseases, of cases where abnormal or diseased condition of the upper jaw affect the orbital contents, and in some rarer instances in which the reverse order of events obtains. The anatomy of the parts concerned is of course always to be borne in mind; seven bones form one orbit and eleven bones

form the two, owing to the contribution to each afforded by the frontal, ethmoid and sphenoid. Next to the frontal the superior maxilla exposes the largest surface to the orbit; its orbital plate grooved by the infra-orbital branch of the superior maxillary nerve may be regarded as the plane of demarcation between the ophthalmic and the dental specialist. Pathology, however, pays little regard to the limits of specialism. The plate is of no great thickness, but is rarely fractured, though its perforation in paracentesis of the antrum is not unknown. Permanent infra-orbital anæsthesia may result from fracture of the upper jaw, or operations upon it. I have notes of a case of acute neuralgic pain referred to the region over the upper jaw, though the skin was anæsthetic, and I stretched the nerve with beneficial result. Only three weeks ago I had a case of herpes zoster affecting the area of distribution of the nasal, labial and palpebral terminal branches of the left superior maxillary nerve, and also the supra-orbital of the same side; there was coincident increase of tension in the eye and vision was reduced to J. 8 with correcting glasses; eserin drops were used for the eye and poppy fomentation to the face, and the vision is now J. 1, the tension normal and the herpes has disappeared. In August of this year a woman, aged 40, was admitted under my care,

with swelling in the region of the right upper jaw, encroaching on the right nostril and right lower eyelid; it was elastic and evidently superficial to the bone, and was attributed by the patient to an attempt at removal of some upper stumps, by a chemist, some two years previously; puncture gave exit to brown mucus, but in a few weeks there was reaccumulation, and under an anæsthetic the walls of the cyst were cut away, the site scraped and plugged with gauze and the stumps extracted—the result was satisfactory.

The nasal duct which establishes a nexus between the conjunctival sac and the inferior meatus of the nose and the major portion of whose bony wall is formed by the superior maxilla, gives rise to a class of disease requiring special care and treatment. Dacryocystitis and epiphora vary greatly in their amenability to probing and the use of styles; where there is bare or carious bone felt by the lacrimal probe it is doubtful policy to persist in its continued use.

The next class of cases requiring consideration are those arising from periostitis of the upper jaw; I have notes of a case of a child of 6, in whom there was proptosis of the globe and much redness of the lower eyelid ascribed to an attack of erysipelas, and incision let out an ounce of offensive pus; it appeared to be unconnected with

either the lachrymal sac or the teeth, and may have been a so-called "residual" abscess or more probably acute periostitis of the maxilla. Salter long ago called attention to necrosis of the alveolar process following the exanthemata in children, but the same cause may also lead to necrosis of the margin of the orbital plate of the maxilla or orbital margin of the malar bone. Such cases are not very rare in ophthalmic *cliniques*, and I have several times had to perform plastic operations for the cure of the ectropion of the lower lid which results from its cicatricial adhesion to the bone. The scar requires to be freely divided, and after removal of a semi-lunar piece of the palpebral conjunctiva the lower and upper lids should be refreshed and sutured together for a portion of their ciliary margins, to be again released when likelihood of retraction is over. In more severe cases it is necessary to remove a V-shaped portion of the lower eyelid.

According to some German figures, phosphorus necrosis would appear to be only slightly less common in the upper than in the lower jaw; it rarely, however, extends beyond the alveolus. Repair after necrosis is apparently less complete in the upper maxilla than in the mandible; its occurrence was doubted by Trélat and Stanley, but Ollier has recorded cases, and Heath relates one in which little deformity resulted after com-

plete exanthematic necrosis of the bone, although in this case it would seem repair was largely of a fibrous character.

In the antrum and its diseases we have the *pièce de résistance* of orbito-maxillary diseases. I need not dwell upon its anatomy—the small and high placed orifice by which its contents drain into the middle meatus, the often loculated condition of its floor, the occasional intrusion of the dental fangs from the canine to the wisdom—and the consequential potentialities of disease thereby occasioned. The name of Nathaniel Highmore has, in English, and also in some continental works, been associated with the antrum, but it was certainly described, figured and named before his time. Highmore was born in 1613, was at Oxford when Harvey came thither with the king after Edgehill, and died at Sherborne in 1651. His "Disquisitio Anatomica" was published at the Hague, and dedicated to Harvey; on page 226 he describes the antrum, and on page 227 there is a rough sketch of it. Nevertheless, Julio Casserio, whose name is immortalised by and identified with the ganglion of the 5th, who died in Padua in 1605, eight years before Highmore was born, had already in his magnificent volume on the five senses published in an *édition de luxe* at Venice, far more faithfully delineated and as accurately described the maxillary sinus.

Electric illumination of the antrum from the mouth has no doubt given us a means of detecting the presence of morbid contents of the sinus in a stage earlier to that in which its walls are expanded. Hydrops, empyema, non-malignant polypi, which are more common than Paget originally thought, and perhaps dentigerous cysts, too, may occasion elevation of the antral roof and encroachment on the orbit. Hunter, who paid special attention to abscess of the antrum and its evacuation through the socket of an extracted molar, observed that the eye might be sometimes "affected," but he did not specify in what way. I believe it is by the inflammatory or necrotic process, either started in the maxilla by a periodontitis or accompanying acute antral abscess, spreading by contiguity to the orbital periosteum or cellular tissue, that orbital and ocular symptoms supervene. When the vision is thus affected the lesion may be erroneously set down as reflex amaurosis, as notably in the case which Sir W. Lawrence and Mackenzie quote from Galenzowski, and which has been spoken of as the most brilliant case of the kind on record; yet in this case there was a repeated discharge of pus in the neighbourhood of the lower eyelid. Such another is that of Pasquier, where fracture of the alveolus in extraction of a right first upper molar was followed by necrosis, orbital pain, tume-

faction of eyelids, amaurosis and dilated pupil—then there occurred abundant, thick, greenish, puriform, fœtid discharge from the right nostril, and the vision returned in eighteen days. In these cases I submit the pressure and traction of inflammatory products on the optic nerve occasion temporary amaurosis, and the extension of inflammation to the nerve itself may occasion permanent amaurosis, just as is seen in cases of cellulitis arising within the orbit. Salter, in Holmes' "System of Surgery," quotes three cases of the kind, one observed by himself, in which the floor of the orbit sequestrated, one by Brück, in 1851, and one by Pollock, in which amaurosis occurred from extension of inflammation round the maxilla from a carious molar but without antral abscess. Gaine has reported a case where loss of vision associated with antral abscess from a carious tooth, on ophthalmoscopic examination showed anæmia of the optic nerve. I have notes of a case where syphilitic nodes within the orbit along with necrosis of the maxilla, exhibited neuro-retinitis, terminating in white atrophy. Snell, in vol. x. of the *Ophthalmological Transactions*, relates the case of a young lady, aged 14, who had fatal orbital cellulitis following extraction of teeth, around which necrosis had commenced. He narrates two other cases, one in a boy aged 8, where

the extraction of a right upper molar was followed by suppuration, orbital cellulitis with proptosis and atrophy of the optic nerve, reducing vision to mere perception of light. The other case was that of a girl, aged 15, in which a disfiguring ectropion resulted from a sinus due to necrosis started by the fracture of a central incisor.

Heath quotes from White Cooper what he calls a unique case of "falling in of the antrum" with epiphora. It seems to me, however, to be similar to, if not identical with, the rare though well recognised *Hemi-atrophia facialis*, an account of two cases of which, with excellent photographs, will be found in the volume of *St. Bartholomew's Hospital Reports* for 1882; in both vision was interfered with by corneal changes, and the upper jaw had fallen in.

Non-malignant tumours of the upper jaw may invade the orbit and damage its contents, such as the so-called fibromata described by Lister and Paget; one of the latter's cases exhibited pulsation of the orbital portion. These are now relegated to the sarcomata, but Heath thinks on "insufficient grounds." There are also enchondromata and osteomata, including the leontiasis of Virchow, which may obliterate the antra and close the orbits as in Howship's well-known case.

During the last two years three cases of sar-

coma of the orbito-maxillary region have come under my care, for all of which I performed operations. The first was that of a man, aged 48, admitted to the Royal Eye Hospital, Southwark, on March 10, 1893. For three months previous to admission he had had left supra-orbital pain, increased by looking to the left, and for three weeks there had been swelling, rapidly increasing in the region of the nasal process of the left superior maxilla, with redness of the eye and epiphora. On examination there were proptosis and outward deviation of the globe, occasioned by a swelling, about one inch in its longest diameter, fixed, semi-elastic, and non-fluctuating; on digital examination of the orbital margin a further swelling was detected above the inner canthus; the conjunctiva was thrown into prominent infiltrated rugæ. There was epiphora, but no nasal tumour nor palatal or faucial implication. The temperature was normal, and there was no syphilitic history nor malignant inheritance, but he had lost flesh latterly. The vision of the right eye was normal, that of the left = $\frac{6}{12}$ and with +2.50D. Ji. I determined to clean out the orbit, and explained to the patient the eye would have to be sacrificed. On March 14, A.C.E. mixture was administered by Mr. Cargill. I made an exploratory incision into the larger mass, which sufficiently revealed its sarcomatous nature. I

then excised the eye and cleared out every particle of soft tissue in the orbit. The tumour appeared to grow from the periosteum near the commencement of the nasal duct. With a stout elevator I scraped the periosteum from the orbital walls, and finally applied Zn. $Cl._2$ and opium paste on strips of lint. It is generally idle to attempt to save the eyelids in such cases; they may be infiltrated, and it would be foolish to sacrifice free removal to cosmetic effect, and even if successfully saved from the escharotic effects of the paste, they will be so drawn in by subsequent cicatrisation as to be unrecognisable. He made a rapid recovery, and the necrosed bones of the orbit came away in the course of two or three weeks; his weight went up, and when last seen two months ago there was not the slightest evidence of local glandular or remote return. The microscopic examination showed it to be a round-celled sarcoma, probably periosteal in origin, though some arise, according to Virchow, from the connective tissue of the orbit. Supra-orbital and infra-orbital anæsthesia ensue in cases where the orbit has been thus evacuated, owing to destruction of the first and second divisions of the fifth.

The next case of the kind came to me at the London Temperance Hospital, in August, 1893. Phœbe S., aged 15, had been treated in May of

that year at another hospital for "a tumour of the eye," which had, it was said, disappeared. The floor of the right orbit was found on admission to be occupied by a hard mass extending to the malar bone; the eye was pushed upwards and proptosed, causing diplopia; she was unable to close the lids, and the ocular conjunctiva was in a condition of gelatinous œdema. Vision was nearly perfect. The same method of operation was adopted in her case, and she made a good recovery. Within two months, however, some suspicious growth was observed at the most posterior part of the orbit, Zn. $Cl._2$ paste was reapplied, but there was again return, evidently extensive and beyond reach. I heard of the patient's death in June, 1894. Probably here, as elsewhere, sarcoma in the earlier years of life is more certain and rapid in its recurrence than at later ages. I have by me the notes of a case of sarcoma involving the hard and soft palate, and spreading past the fauces to the base of the skull, in a child aged $2\frac{1}{2}$ years only; in her case the first symptom was observed only two weeks before admission; and though tracheotomy prevented suffocation for a while, the growth was so rapid that in eighteen days the child died.

The last and by far the most interesting case with which I shall trouble you, is William W., who has been on and off under my care at

the London Temperance Hospital during this year. He was 42 years of age, and was sent to me on Jan. 30 with a letter from Dr. C. L. Lightfoot, of Newcastle, stating that six weeks previously a small tumour had been removed from the lower margin of the left orbit, and also some "polypi" from the left nostril. Microscopically these proved to be sarcomatous, and recurrence *in loco* had already taken place. An unfavourable prognosis had been given, and a more extensive operation was suggested as the only hope. The patient stated that he had had ague and rheumatic fever and jaundice; the "polypi" had troubled him since June, 1893; there were sharp shooting pain in the orbit, a discharge from the left nostril, and an unpleasant taste in the mouth. He had lost flesh rapidly. He was admitted into the London Temperance Hospital on Feb. 3, 1894, and this photograph exhibits the condition of the parts as then seen. The left eye was normal, but diverted, and there was diplopia when the lids were separated; the skin over the swelling was red, adherent, and evidently involved. The left nostril was blocked by a fleshy growth, and the septum deviated to the right. He snored at night. The roof of the mouth appeared to be healthy, but the finger encountered growth in the left posterior nares. There was no obvious

glandular enlargement; the urine and organs were healthy. The man looked cachectic, and weighed only 8st. 4lb. On Feb. 7 chloroform was administered by Dr. Wilde. Dividing the upper lip to the left of the middle line and opening the nose, I found the greater part of the superior maxillary bone soft and friable; the antrum contained soft growth, and the nose, ethmoidal and sphenoidal cells, and orbit were invaded. The orbit was cleared out, also the antrum down to the palate, which appeared healthy; the whole of the bones of the left side of the nose and inner wall of the orbit, as also the vomer and septum, had to be sacrificed. No soft parts were left between the roof of the orbit and the hard palate; the ethmoidal and sphenoidal and frontal sinuses were scraped out with a sharp spoon; all the implicated skin was cut away, the lip was united by a harelip pin and sutures, and chloride of zinc and opium paste on strips of lint was packed against the exposed bones. The hæmorrhage was free but not very troublesome, as I plugged the posterior nares with lint and hung the head well over the end of the table. On Feb. 8 the patient had had very little pain. He had slept for eight hours. He was taking food well through a tube. On the 9th the pin was removed. Movements of the soft palate and the Eustachian orifices were

seen on looking into the orbit. On the 17th the temperature was normal, there was no pain, and the sloughs were separating. On the 23rd he was gaining weight at the rate of about one pound a day. On March 2, one or two suspicious places in the neighbourhood of the ethmoid had been touched with chloride of zinc paste. On the 8th the patient was discharged. The microscopic examination showed round and spindle-celled sarcoma. On April 20 he was re-admitted, owing to some more suspicious spots having appeared and some enlarged glands having presented themselves in the superior carotid triangle. The paste was applied to some growth springing from the infundibulum. On May 3 a small packet of three or four infected glands was dissected out of the neck under chloroform. On the 6th the wound had healed.

With the assistance of Messrs. Arnold & Sons I designed a silver plate, with a glass eye let into it, and secured by a pair of tinted spectacles; the cosmetic effect was satisfactory. On Aug. 7 the patient presented himself for inspection, looking robust and well, and showing no sign of recurrence anywhere; he had lost the cachectic tint he previously had, and had gained 5lb., his weight then being 9st. 6lb.

In October, however, he was again sent up

to me, and I found a suspicious spot just inside the left nostril, which I scraped out with a sharp spoon and applied paste to the raw surface left. I also found two more enlarged cervical glands which I excised, and I am glad to be able to report that an inquiry sent to Newcastle last week elicited the reply that he was quite free from any further local or glandular recurrence and was gaining in weight.

These, gentlemen, are the cases I have presumed to bring to your notice in response to your Secretary's invitation. I apologise for the fragmentary character of my paper by pleading the lack of any consecutive leisure. I fear, in trying to be less iconoclastic than in my last endeavour, I have succeeded in being intolerably dull. I throw myself on your indulgence, and await your kindly and candid criticism.

Discussion.

Mr. S. J. Hutchinson said he had the privilege of being in the chair when Dr. Collins read his paper in 1891, and he was the unfortunate user of the word "iconoclastic." The fact was that he had many idols on the subject of reflex influence, and he felt that his best idols were shattered on that occasion. As far as he could follow the paper, Dr. Collins seemed to have taken the following position. Firstly, he did not admit that there could be a reflex amaurosis. Secondly, he said that there might be reflex pain but not reflex lesion; and thirdly, that when there was disease it was due to the direct spread of periosteal inflammation. They were of course very much indebted to Dr. Collins for the very interesting series of cases that he had quoted. He (Mr. Hutchinson) admitted that since 1891 he had been on the look out for any chance of controverting Dr. Collins' assertion on that occasion, but he was bound to say he could not produce a single case that could support his own castles in the air and prove ocular disease directly produced by reflex dental irritation. They were greatly indebted to Dr. Collins for his paper, and he was glad to think that he (Mr. Hutchinson) might have been in some measure the means of inducing him to write it.

Mr. Robbins, though unable to discuss Dr. Collins' paper, wished to mention a case which came under his care some years ago, and to ask Dr. Collins whether he was right in making the deductions that were made at the time. It was the case of a very anæmic patient, who had been suffering for nine years with extreme neuralgia, who came to him for artificial dentures. He found in the lower jaw on the right side a molar which did not give any reflex signs, but

was very much eroded. As it leaned forward and would have thrown the case out entirely, he suggested its removal, and had considerable difficulty in getting it away. He found erosion, exostosis and absorption of the roots. After the removal of the tooth the neuralgia was better, and she localised it in a superior six-year-old molar on the right side. The tooth had been very much stopped. It was a mass of gutta-percha, and in attempting to remove it he took off the crown. The roots were divided and removed. They were badly exostosed, and then a strange thing happened; she seemed to lose the sight on that side. She had constant and extreme lachrymation, and an increase of the neuralgic symptoms, but as the very large wound healed up the signs subsided, and in less than a fortnight she perfectly recovered, and her power of vision became normal.

Mr. F. J. Bennett said there was no doubt a certain good could be derived from an "iconoclast," for if the images were false, surely it were far better that they should have them broken and make new ones, than continue to worship the false ones. He was extremely pleased the last time Dr. Collins read his paper because there was a case which personally interested him, and which had been put down as reflex amaurosis. It occurred when he was a student at the Hospital, and was brought before the Society by Mr. Coleman, and alluded to subsequently by Mr. Henry Power. It was a case in which a root, being prepared for pivoting, exhibited some irritability at the apex. Shortly afterwards there was a good deal of photophobia and irritation about the eye. Thinking it possible that it might be of dental origin, the patient was examined by Mr. Lawson, who said he was positively certain it had nothing whatever to do with the root, but was a case of iritis. His (Mr. Bennett's) experience was extremely small at that time, but it had always appeared to him strange that in the face of that opinion some should have held that it still was undoubtedly reflex amaurosis. Dr. Collins now took an opposite view, and he seemed strengthened in his opinion. They must not forget that co-existence did not always mean cause and effect. There might be a condition

of the eye which gave rise to trouble, and also of the tooth, but because they were co-existent it could not be said that one depended upon the other.

Dr. Ernest Clarke said Dr. Collins stated it was only the thin orbital plate of the superior maxilla which separated the dental surgeon from the oculist, but he also went on to explain that in pathology there was no separation at all. He wished to congratulate the Society upon having this paper read before it, and expressed the wish that the Ophthalmological Society would follow the example and invite the President to read a paper before it on some dental subject connected with the eye. He (Dr. Ernest Clarke) wished to make one or two remarks upon the subject of so-called reflex dental irritation. For some years he had paid special attention to "eyestrain" in all its forms, and had thought that one thing of itself was very often quite insufficient to produce eyestrain. Hypermetropic astigmatism of itself might not cause eyestrain if the patient was perfectly healthy. He illustrated this by the case of a lady who complained that she suffered very severe headache at every monthly period. She consulted various gynæcologists, and finally came to ask him if he thought it was the eyes which were the cause of the headache. He found she had astigmatism, but the curious part was that she only had these severe attacks at the catamenial periods, at which time she was obliged to keep her bed. Between the periods she was perfectly well. His theory was that the strain was not sufficient to cause the headache except when the system was lowered, and that the catamenia was just the "last straw" which lowered the vital force. So it might be in dental irritation. If dental irritation of itself would cause trouble in the eye and amaurosis, a great many people ought to be blind. He invariably at the hospital examined the mouths and the teeth of his patients, and the result was very bad indeed. He thought, however, probably the dental irritation might be a "last straw" which caused some trouble in the eye. Two months previously a lady was sent to him by a doctor, with blindness coming on in

one eye. Her vision was only one-fourth of normal, and on examination with the ophthalmoscope he found that she had optic neuritis, which appeared to be going on to retinitis. He found two very bad molars in the upper jaw and told her to go and see her dentist, having previously tried the effect of iodide of potash and other drugs, but without result. The vision went down to one-sixth, and before the extraction of the molars she only saw six-sixtieths. A week after the molars were extracted her vision had got back to normal, and now she was perfectly well. She was perfectly convinced that the trouble was due to the teeth. Those teeth must have been in her mouth many years, and the question was, if that was reflex amaurosis why did not it occur before? Some clue was afforded by the discovery that she had come to the change of life, when so many women were ill, and he supposed this was again the "last straw." He should not dream of saying in the face of what Dr. Collins had stated that this was reflex amaurosis, but certainly there was dental irritation, and on removing the molars the eye got perfectly well. He thought they were rather too apt to use the term "reflex" as a sort of refuge for the destitute when it was desired to find some cause, and if Dr. Collins had done nothing else he had made them alive to the fact that they must not be so ready to call a thing "reflex" if the cause was not easily discoverable.

Dr. Collins, in reply, said his task was much easier on this occasion than it had been on the last. There had been hardly any discordant voice, but all seemed to agree in supporting the position which he held on a previous occasion, and which he maintained to-day. He wished to make his position quite clear. It was not that there was never in any instance a reflex lesion of the contents or appurtenances of the orbit as the result of dental irritation; in fact, there were such cases, *e.g.*, reflex spasm of the orbicularis muscle. In the same way as spasm of the masseter muscle arose through reflex action descending through the motor branch of the fifth nerve, so reflex spasm might be traced through the motor seventh nerve. There was no

difficulty in explaining such cases. When, however, they endeavoured to associate by an elaborate reflex process the region of the second pair of nerves with the region of the fifth, the anatomical path was anything but clear and distinct; on the other hand the spread of inflammation by contiguity was very obvious and clear. It was flying in the face of the law of parsimony to invoke a difficult explanation when a very direct and obvious one was at hand. He wished that the case mentioned by Dr. Clarke could have been investigated more thoroughly; possibly it might prove to be one of the first cases on record of reflex amaurosis, or it might be relegated to the more direct category of the spread of inflammation. Dr. Clarke rather seemed to agree with him in thinking this the more probable explanation. He had heard of one case of albuminuric retinitis which was attributed by the patient to the loss of blood following the extraction of several teeth. The ophthalmoscope showed, however, that it was due to Bright's disease, and the patient died from cerebral apoplexy. No doubt in the dusty volumes of the College of Surgeons' library, cases of reflex amaurosis might be found almost *ad nauseam*, but when they came to ophthalmoscopic days and searched the *Transactions* of the Odontological and the Ophthalmic Societies, such cases were either very rare or not to be found. The fact was that the means of investigation which Helmholtz, in 1859, placed in their hands in the shape of the ophthalmoscope, had cleared up many mysteries. He remembered the case referred to by Mr. Bennett, which showed how even a recognised authority like Mr. Coleman, upon faulty ophthalmic records, might regard a case as being one of reflex amaurosis, which when seen by the oculist to Her Majesty was pronounced to be nothing but iritis. He had listened with interest to the case quoted by Mr. Robbins. In that case the dimness of sight might perhaps be attributed to the lachrymation. He was afraid that if he suggested a possible explanation which occurred to him he should be again put down as unduly sceptical. That very afternoon a child came into the out-patient room of the London Temperance Hos-

pital with dilated pupil of the left eye. The commonest cause of mydriasis in out-patient practice was atropine. He said, "You have been putting something into that eye." The reply was "Oh, no." But at last he discovered that the little boy's brother had been under his care two or three years ago, and there was a little ointment left over, and that ointment had been used in this case. Such an occurrence was not uncommon. Belladonna was often used as a liniment for neuralgia, and belladonna might produce dimness of vision. That was an element of doubt which ought to be distinctly cleared up before any final conclusion could be drawn. He would not suggest in the presence of Mr. Robbins that that was the real explanation of the case he had mentioned, but it was a point which ought to be borne in mind. In conclusion he expressed the great pleasure he had had in reading his paper. He was glad to find the position he had put forward somewhat timidly some years ago so largely confirmed by the best dental knowledge, and it had been a great satisfaction to him to appear before them again.

The PRESIDENT said it only remained for him in the name of the Society to tender their sincere thanks to Dr. Collins for kindly coming amongst them on what he hoped would not be the last occasion. Their thanks were also due to those gentlemen who had brought forward Casual Communications.

BARRAUD, PHOTO. *Woodburytype.*

FELIX WEISS, L.D.S., ENG.

The following nominations have been submitted to the Council :—

For Resident Membership—

Farmer, Francis Mark, L.D.S.Eng., 17, Great Marlborough Street, London, W.

Prideaux, Harry Symes, L.D.S.Eng., 25, Bloomsbury Square, London, W.C.

Rooke, Fred. J. Frankland, L.D.S.Eng., 42, Kensington Gardens Square, London, W.

For Non-Resident Membership :—

Nicol, J. Main, M.R.C.S.Eng., L.R.C.P. Lond., L.D.S.Eng., 2, Clarendon Road, Leeds.

Peake, George Arthur, M.R.C.S.Eng., L.R.C.P.Lond., L.S.A., L.D.S.Eng., Alma House, Cheltenham.

Porter, Frank C., M.R.C.S.Eng., L.R.C.P. Lond., L.D.S.Eng., 12, Oxford Street, Nottingham.

Skipp, George Nash, L.D.S.Eng., Sale, Cheshire.

graphs of human teeth, which had been taken and published by Dr. Röse and Dr. Gysi.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

January 14, 1895.

Mr. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

President, in the Chair.

The Minutes of the last meeting were read and signed as correct.

The following gentlemen were balloted for and elected members of the Society :— John William Pare, M.D., C.M.Edin., L.D.S.Eng., 18, Portland Place, W. (resident); F. E. Davar, L.D.S.I., Church Gate Street, Fort, Bombay, India (non-resident).

The following nominations were proposed to the Society for resident membership : — A. E. Baker, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng., 22, Grosvenor Street., W. ; Percy Francklin Henry, L.D.S.Eng., 79, King William Street, E.C.

The following nomination was proposed to the Society for non-resident membership : — Ridley Herschell, L.D.S.Eng., 6, Seaside Road, Eastbourne.

The Curator announced the presentation, by Mr. Kölliker of Zurich, corresponding member, of a set of photo-micrographs of human teeth, which had been taken and published by Dr. Röse and Dr. Gysi.

The Librarian said he had only to report the reception of the usual exchanges of periodicals.

Mr. J. J. Andrew described a case of odontome of the upper jaw. The case was, he said, one of great interest. He had the opportunity of examining this odontome through the kindness of Mr. J. Royston, who obtained it from Mr. Rushton Parker, of Liverpool, who operated for its removal. Mr. Parker stated that the patient, D. M., aged 17, noticed a swelling of the right upper jaw about April, 1893, preceded by toothache. After two or three days of pain, he had the second bicuspid removed, and the swelling diminished slightly. When seen by Mr. Royston the odontome was recognised, and he was sent to the Royal Infirmary to have it removed. The cheek was prominent and the alveolar border greatly widened, with an ulcerated opening through which the odontome could be seen exposed and bare, undergoing necrosis at that spot. The patient being put under chloroform in June, 1893, the odontome was removed by means of periosteal raspatories, and in this way it was dislodged in a few minutes without any cutting of the soft parts or fracture of bone. The cavity left was found lined with granulations and lymph, indicating the inflammation which had previously existed. It was treated with a little cotton dipped in whisky and water, which was also used as a mouth-wash for antiseptic purposes. The odontome measured $1\frac{1}{2}$ by $1\frac{1}{4}$ inches, of irregular shape, and bearing evidence of having arisen in two teeth, the first and second molars. No elevation of temperature resulted, or other interference with the patient's health, and after five days in hospital he went for a fortnight's holiday in the Isle of Man, being directed to wash his mouth and the alveolar cavity with borax and water. On his return there was still a large hole and distinct prominence of the cheek. He returned, however, to his work as a railway clerk. On further inspection in May, 1894, eleven months later, there was no further prominence of the cheek or other deformity. In the alveolar border there was now only a small pit or crevice, in the bottom of which the wisdom tooth could be seen. Mr. Royston, in

Fig. 1.
Fragment of Odontome. (Mr. Royston's Case.)
Mag. 12 diam.

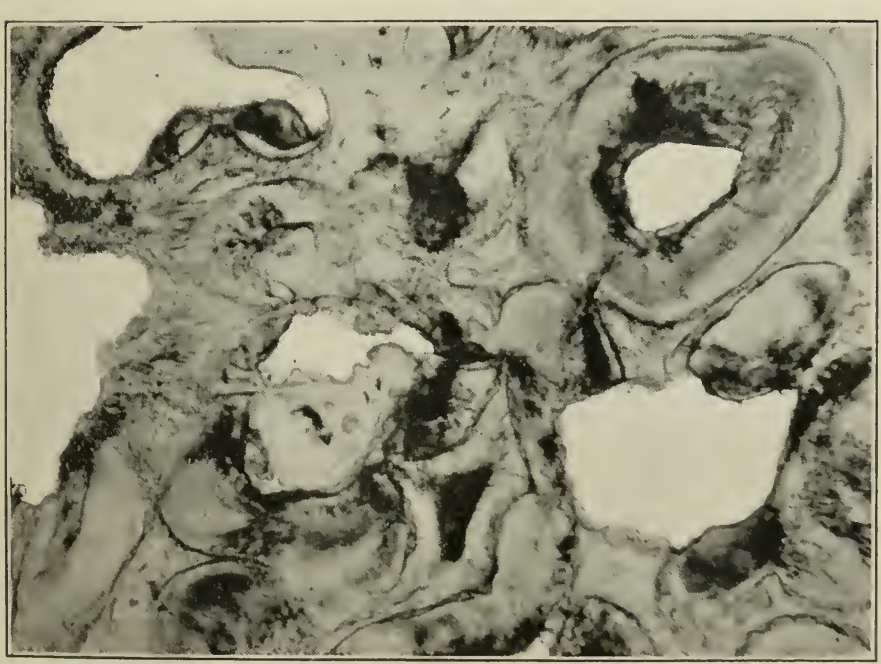

Fig. 2.
Fragment of Odontome. (Mr. Royston's Case.)
Mag. 80 diam.

his notes on the case, states that he was first asked to see the patient at the Liverpool Dental Hospital by a student, it being supposed that the trouble arose from a bad root. He found the face much swollen, also the mouth, with a slight discharge on the gum. There was no antrum trouble discoverable, but a curious-looking mass projected through the gum in the molar region, slightly movable and apparently large. Diagnosing an odontome or some unusual condition, he sent the patient on to Mr. Rushton Parker for advice or operation, first taking an impression of the mouth. A few months after the operation another impression was taken by Mr. Royston, and a third only a few days since. These models were now exhibited. After the last impression was taken, as the wisdom tooth was of no use and causing some irritation, it was extracted. This tooth, which he now exhibited, showed that one of the roots was quite folded on itself, though otherwise the tooth was well developed. A case like this was rather a strong point in favour of each tooth being developed from a distinct and separate tooth germ, and not, as they had for a long time held, from a branch given off from one of the earlier molars. When he (Mr. Andrew) got the odontome it was dry, all the soft tissue gone; it was more or less oval in shape, rough, with numerous depressions and projections on its surface. One large projection which showed through the gum on the opposite side was one main foramen filled with soft fibrous tissue. Its length was $1\frac{5}{8}$ inches; girth, $4\frac{1}{2}$ inches; width, $1\frac{1}{4}$ inches. He omitted to weigh it as a whole, but as the remaining small half weighed 190 grains, the whole odontome must have weighed about 500 grains. The large half was cut up for microscopic examination, sections being made in various directions. The odontome came in Mr. Bland Sutton's classification as "No. 7, composite odontome," the old classification being, "Bulbar odontoma." The structure was shown to be complex and very mixed; in parts, labyrinthine or folded in appearance; in others, osteo-dentinal. The main body of the odontome was dentine, though of a very irregular character, full of openings and canals, with patches and

crescents of enamel in all kinds of positions scattered through it. There was very little cementum, but a few lacunæ occurred in parts. Mr. Andrew illustrated the communication by a number of photo-micrographs shown on the screen.

Mr. S. J. Hutchinson asked Mr. Andrew whether he was prepared on the very complete exhibition he had just given of sections of this odontome to abandon the theory that the first, second, and third permanent molars were descendants one of the other, and of the second temporary molar. If so, this was even more important than the very admirable illustrations which had been given. It was one of the most debated points at the present moment in dental physiology, and if Mr. Andrew would give his opinion on the point, as he had already done on a former occasion, they would probably learn something from the pathology of these particular cases which might help them with regard to the physiology.

Mr. Andrew said he was not at all prepared to abandon the theory, which was rather a pet notion of his own, as to the development. Some years ago he thought he had a good example of it, and showed it to Mr. Tomes; in fact, it it was one of the things that almost persuaded Mr. Tomes to go back to his original love in that direction. Some of the American men were very strong on the theory that each tooth was developed from a separate germ, and they thought they had proved their point. The wisdom tooth which he had shown was one of the strongest points in their favour which he had himself seen, but he was not quite prepared to abandon the other notion.

Mr. Mansbridge described certain methods of antrum drainage, and said there were two methods that he found useful in treating certain cases of drainage in antrum trouble, and he thought the suggestions might be useful to some members of the Society. In order to minimise the risk in such cases of food or other foreign bodies being forced up into the antrum, he had adopted the plan of soldering at the lower end of the tube another piece at right angles,

thus having the opening towards the cheek, and providing a drain without the risk of the food being forced up. A case, however, presented itself, in which communication between the palate and the antrum was exceptionally sensitive, the patient could hardly bear the pressure of any foreign body against the sides of the canal. The opening also ran obliquely upwards and inwards, therefore a rigid tube was difficult to adjust without producing a certain amount of pressure on the walls of the opening, which was difficult to overcome. In this case he adopted the plan of making the tube separate from the plate, having a small piece of metal stamped and soldered to the tube to prevent it slipping up; this being *in situ*, asecond impression was taken and a vulcanite plate made to cover the opening of the tube. In this way there was no possible chance of food being forced up into the antrum, and the patient was able to syringe the antrum through the tube, with the tube *in situ*, simply by removing the plate two or three times a day. He produced a model showing the tube and plate in position.

The second case was one that occurred in hospital practice, in which the opening into the antrum was very high up on the outside of the gum. As the outer side of the opening was closely impinged upon by the cheek a rigid tube fixed to a plate would have been out of the question. In this case he adopted a movable tube, the opening being made at the side, so that all chance of food getting forced up was obviated. He produced a model with tube and plate *in situ*.

Mr. Badcock said he had abandoned the use of the tube altogether, finding that it had not all the advantages that it was thought to have in the way of drainage. It certainly would give access to foreign bodies in the way Mr. Mansbridge had suggested, and he was not sure that it made a very efficient drain, seeing that they might either get the end of the tube a little beneath the level of the floor of the antrum, in which case there was a tendency for the opening to close in that position ; or they might get it too high, when, if there was only a slight accumula-

tion to be drained, it would not rise over the edge of the tube and so properly escape. They were somewhat difficult to keep clean. He suggested that a solid plug could be easily introduced, taken out, and much more easily kept clean. If the plate was removed from time to time the antrum could be syringed and the opening maintained by the plug. In cases where it was difficult to insert a plate and a plug in one piece, he often made a separate plug which was attached to the plate by means of a little ligature, and worked very well.

Mr. Mansbridge said he quite agreed as to the solid tube acting well in certain cases, but, in the particular case he noted, where the canal between the mouth and the antrum was so exceedingly sensitive that the patient could not bear to take anything in or out, he found it very useful to syringe through the fixed tube. No discomfort at all was felt from the presence of the tube.

Notes on Amalgams.

By C. S. Tomes, M.A., F.R.S.

Mr. President and Gentlemen,—The subject of the behaviour of amalgams is one that has for many years been to me very interesting, and so long as twenty-two years ago I read a paper upon it before this Society, establishing upon an exact experimental basis that, almost without exception, amalgams contracted as they hardened.

The experiments described in that paper were mainly based upon the specific gravity method of ascertaining what, if any, change of bulk took place during the process, and certain conclusions were reached as to the beneficial effects of the addition of gold and platinum to the alloys.

Since that time a good deal has been published upon the subject by Messrs. Fletcher, Kirby, St. George Elliott, Bogue, Foster Flagg and others; but as it is not my purpose to do more now than detail the results of recent experiments of my own, and as this paper can have no pretensions to being anything more than a passing and incomplete contribution to the matter, any detailed

reference to these papers, some of which have been of the greatest value, would be out of place, and, moreover, would take up more time and space than is at my disposal.

I will, therefore, only mention that while Dr. St. George Elliott, following out the same specific gravity methods, in the main confirmed my results some ten years later, Mr. Kirby laid much stress upon a change of form as well as a change of bulk taking place, and as I understand him, attributed even more importance to this than to actual shrinkage.

In my earlier experiments I found that palladium alone was free from this vice of contraction. As is well known, palladium is far the best of all amalgams in its practical results, but it is difficult to use, owing to irregularity in the behaviour of different samples, and also owing to its exceedingly rapid setting, which almost precludes its use in really difficult situations. Moreover, though it does not stain the tooth, it itself becomes of an inky blackness.

I allude to this because I think that it is quite possible that some of its merits are due to this rapid setting, by which it results that the filling is hard, and no further change has to take place after it leaves the operator's hands; to this I shall have occasion to recur at a later stage of the enquiry.

My present series of experiments have been devoted, not to the improvement of the constitution of amalgams, but to the means of getting the best results with those in ordinary use, and they have for the most part been conducted with Eckfeldt and Dubois' standard amalgam, that being known to be a good one; it contains, as is well known, tin, silver, copper and gold.

Previous experiments having satisfied me that Dr. Bonwill's method of inserting the amalgam fairly plastic, and squeezing it dry in the cavity by the repeated application of pads of bibulous paper, removing from time to time the softer portions into which the excess of the mercury had been squeezed, gave upon the whole the best results as to water tightness, this method was usually employed; though a good many experiments were made with Mr. Kirby's method, viz., using decidedly plastic amalgam for the bulk of the cavity, and finishing with some that was very dry, the idea being that in this way the mercury would be most evenly distributed through the mass finally. In order that the experiments should compare fairly with one another, a great number were made in round holes about $\frac{1}{4}$ inch in depth, and $\frac{1}{8}$ inch in diameter; these were bored right through slips of bone or ivory, which were clamped on to a flat surface of ivory whilst being filled, and then at once plunged into an ink

pot (Draper's ink—condemned by Dr. St. George Elliott as being too severe a test—being usually employed); in every single instance I get more or less leakage. I began by packing amalgams (standard and flint edge) into cavities, and examining the surface under low powers of the microscope, and was a little surprised to find that no matter how dry the amalgam, and no matter how carefully it was burnished, the surface is soon covered with little hemispherical eminences; this applies not only to the original free surface, but to that which was in contact with the walls. But if it is burnished after it is set, these eminences are smoothed down, and the burnish remains.

It seemed possible that the leakage of fillings when subjected to the ink test might be due to this irregular surface, and so I tried lining the cavity with a film of No. 10 gold. This had the effect of getting a surface, where the gold had been, of a much finer grain, but the fillings failed as badly or nearly so as before. Moreover, I found that the fillings were not really a very tight fit, but that they could sometimes be poked out through the holes without breaking the ivory slips, and that when these were broken, so as to leave about half the periphery, or a little more, the amalgam could be very easily dislodged from the remaining cavity. It seemed, therefore, clear

that we had to do with a real shrinkage, and not with a surface too lumpy to make a water-tight joint.

Similar experiments were tried with tinfoil, and with a layer of a single thickness of heavier gold.

The great brilliancy of the little hemispheres when viewed by reflected light suggested that perhaps they consisted very largely of mercury, so I tried scrapings of the free surfaces and compared them with scrapings taken from the interior of the mass, with the result that, as might have been expected, from what is known of the mercury squeezing out to the surfaces, there was a much larger proportion of mercury here than in the centre of the mass, whilst during setting this was to some extent, but not wholly, redistributed.

I may mention also that I found that a fine surface against the walls was obtained by the use of a very fluid amalgam, so fluid as hardly to set, just such as is used in making a looking-glass, but this, of course, is no use for our purposes; if heavier gold was used it did not completely amalgamate, nor, of course, did the compound gold and platinum foil become permeated through with the mercury. But still the ink test showed imperfect contact with the walls, and so I abandoned the idea that it was the granularity of the surface which was in fault.

I then tried lining the cavity with a thin, quite thin, layer of amalgam, and then filling up the rest of the cavity with Harvard cement, and now for the first time got an absolutely perfect result, thereby conclusively proving that the surface of the amalgam was fine enough to be water-tight, and that it was to shrinkage or change of form that its faults were due.

Experimenting further in this same direction, I found that it was possible to line the cavity thinly with amalgam, then fill up the great bulk of it with soft Harvard cement, and then coat the free surface with amalgam. This gave a very good result, so that we had here a plug the bulk of which was Harvard cement, with which there is never the smallest difficulty in getting water-tight fillings, encased in a shell of amalgam, which would serve to protect it against any chemical disintegration by the fluids of the mouth.

So far, then, the tendency of my experiments seems to be in the direction of showing that amalgam was not, and could not be, a good material of which to make the whole of a large filling, but that its most reliable function would be to confer hardness and resistance to chemical action upon such materials as osteoplastics. So far, then, it seemed to point to the conclusion that no very large filling should ever be made of amalgam used in the ordinary methods.

It remained, then, to try what could be done in the much more awkward cavities which would occur in actual practice, the experiments having so far been conducted in cylindrical holes.

I found that there was not much difficulty in lining the bulk of a cavity with a thin layer of amalgam, filling it nearly up with Harvard cement, and whilst this was still soft covering it over with a layer of softish amalgam—which, by the way, will adhere so well to the cement—while this is still sticky, that it need be but of very small thickness—indeed, I have since heard that Mr. Holford often uses it as a mere wipe over the surface of an osteoplastic filling with the view of protecting it somewhat from chemical action. We thus get a filling of Harvard cement encased all round with amalgam in so thin a layer that its contraction becomes insignificant, and good results are practically so obtainable.

I have been asked why line the cavity at all with amalgam. My idea was that the fluids of the mouth should at no point whatever get access, even in ever so small a degree, to the cement, which they would do if the cement cropped out anywhere, while, on the other hand, I was anxious that the thin layer of amalgam against the edges should everywhere be held up to its place by the setting of cement, and not of a mass of amalgam which would be likely to shrink and alter a little in form.

It then occurred to me that it might be possible to embed something in the amalgam which, if it did not prevent its shrinking, might, at all events, compel it to shrink in some other direction than away from the walls, and with this end in view I made some rings of dental alloy, and others of steel, about pin wire size, and of such size that they, when laid flat in the holes, left only a small space between themselves and the walls. These were sunk in the amalgam, so that they just escaped showing on the surface. But although, perhaps, they effected a slight improvement, in spite of them the amalgam drew away from the edges enough to let the fillings leak, so after a good many trials I abandoned them as not so useful as I had expected.

Next I tried embedding a lot of pieces of porcelain tooth in the mass, distributed generally through it, and here again met with failure to get quite perfect results, and the same thing was true when I used pieces of old set amalgam.

Then I tried laying two or three thicknesses of bibulous paper in the cavity, filling with rather plastic amalgam, and withdrawing it before it was fully set; then, after keeping the filling thus made—which was, of course, a little small for the cavity—till it was quite hard, it was re-inserted with a small amount of fresh amalgam round it so as to fix it in place.

This having been found to be rather impracticable, I tried fixing the loose filling in place by means of rather soft phosphate cement, smearing the actual edges of the old filling with amalgam somewhat soft, so that none of the phosphate cement should crop out at the edges.

In this way I was pretty successful in getting water-tight results, but it was a little difficult to manage. Still, I am not sure but that where we remove an amalgam filling which has failed and become loose, we should not do better to use it over again in this way rather than to employ a large mass of new amalgam which has got all its shrinking to do.

If the amount of phosphate be well judged, but little will squeeze out, and it may generally be so manipulated that it comes out all at one side, where it can be scraped away and amalgam packed into the chink at this edge.

Of course there is no advantage in using a mass of set amalgam rather than any other indifferent substance, save only that it may be got so nearly fitting the cavity that there will be very little fresh amalgam round this edge.

So far, then, I had not met exactly with what was wanted, though I had learnt that it was possible by minimising the quantity of new amalgam to proportionately diminish the total shrinkage, and so to get a better approximation to water-tight plugs.

It is well known that a large number of amalgams which have already set will, like Sullivan's amalgam, soften again with heat, but they, or, at all events, most of them, set again with great rapidity—in fact, as soon as they are cold.

Taking the standard amalgam, which, as containing some copper, seemed most likely to answer such a purpose, I softened bits of it in a Bunsen burner and rapidly rubbed them with a warm burnisher into some of the cylindrical holes. The result was an absolutely water-tight plug, but the rapidity with which it set rendered it very difficult, if not impossible, to use it in average amalgam cavities, or to contour it. But I also found that if the cavity were filled up so as to cover up the edges, it was possible to go on contouring with freshly mixed amalgam without interfering with its water-tight edges, and so the question seemed to be to some extent solved. By putting on one of Mr. Lennox's admirable matrices, it was not difficult to do this in an accessible cavity, but the difficulty of the very rapid setting remained, which rendered this of no avail in difficult positions; and, moreover, the high temperature of the pieces inserted would seem to limit its use to dead teeth, or to those thickly lined with an osteoplastic material. By adopting this method of using amalgam already set, and heated to soften it, a beautifully fine

grained surface was always obtained, which retained its burnish although at once plunged into the ink, and the surface so obtained was wholly free from the spherical eminences which I noted as occurring with all freshly-mixed amalgams. I have employed this method in the mouth in a few cases, using a matrix to render it easier to get it up to a contour, and with results which, so far as appearances go, look after a few days most satisfactory as regards perfection of edge, &c., and I did not find it difficult, though owing to my inexperience, I selected cavities thoroughly accessible.

Since arriving at this result it has been pointed out to me that Dr. Otolengui, in his book entitled "Methods of Filling Teeth," advocates the use of fragments of previously hardened amalgam for the purpose of burnishing them into the surface of freshly inserted amalgam, obtaining by that means a rapid hardening of the surface. From my own experiments I do not doubt that he thus gains a material advantage, but my method differs fundamentally from his in that I would employ the old amalgam to line the cavity, and if I employ any freshly mixed it is upon the surface, and to build up the contour—in fact, it is in some sense the converse of his method.

The next step seemed to be—the difficulty of

water-tightness being more or less solved—to find an amalgam which would, when re-heated, set a little more slowly.

I first tried increasing the proportion of gold in the alloy, but this had no effect in that direction. Next I tried copper, in the form of Sullivan's amalgam, though as Sullivan's amalgam does not fulfil all our requirements, I was reluctant to add much; however, unless a large proportion of Sullivan was added I found that the setting still remained too rapid for convenience. It next occurred to me that perhaps some freshly mixed amalgam might be added to the old heated amalgam without altogether losing the advantages which this seemed to offer; accordingly, I added an equal weight of fresh amalgam, mixed so as to be thoroughly plastic, to a piece of heated old amalgam, and rapidly rubbed them together in a hot mortar. The mix thus obtained was pretty easy to pack into a cavity, though it set rather too fast to be quite convenient. The resultant plugs proved to be generally water-tight.

I next tried adding double the amount of freshly mixed amalgam, and still was able to generally get water-tight plugs, whilst there was ample time given for packing in a previously dried cavity. These experiments so far had been conducted with standard amalgam, which is itself a pretty rapid setter.

I then reverted to my old experiments of five-and-twenty years ago, and ascertained the shrinkage of the masses by the specific gravity test, with an exceedingly delicate balance; under this test, which has to be used with a number of precautions into which I need not enter here, in order to get accurate results it was found that while standard amalgam does not shrink very badly, even when freshly mixed, the shrinkage is wholly absent in equal parts of old heated amalgam and freshly mixed amalgam thoroughly incorporated together.

There may have been a very trifling shrinkage in the first five minutes, but after that there was none, so that it may be assumed that no change would ensue after it left the operator's hands.

It really seems, therefore, that by this method of using this amalgam, perfectly satisfactory results are attainable, and I then proceeded to try it in difficult cavities in actual teeth, in which I got again perfectly good results. I then took another amalgam, namely, the flint edge, which under ordinary conditions does not give results quite so good as the standard, but was not so pleased with the results. It may be that the presence of some copper makes an amalgam re-heated more workable. My own belief is that in order to get water-tightness in full degree it is quite essential that the setting should be rapid; more rapid, perhaps than is wholly convenient.

Absolutely perfect results were usually got by using none but the old amalgam, packed in in a succession of small pieces, but when this was done each piece set as fast as it was put in, and the plug was absolutely hard, and had no further changes to undergo the moment the plug was finished. Unless, however, care is taken and the cavity be easy and accessible, there is a danger of imperfect cohesion between successive portions, and the same thing may be said of fillings commenced in this way and finished by the addition of new amalgam to contour. In these it was possible after breaking up the teeth and removing the plug to split the latter along the line of junction of the two kinds, although there was, I think, ample strength for all practical purposes. Amongst other advantages, though that is a trivial matter, the method is very economical, for it enables the operator to use up every scrap of excess amalgam that he may have mixed up at any previous time.

To sum up the results:—

(1) With the exception of palladium it was found impracticable to get absolute water-tightness by any methods of packing in vogue.

(2) Perfect results can be obtained by making the mass of an osteoplastic, using the amalgam only as a protective agent, to keep the fluids of the mouth from having access to the plastic filling.

(3) Advantage, short of perfect results, can be got by diminishing the amount of fresh amalgam with its shrinkage still to do, whether by embedding rings, lumps of hard amalgam, or other foreign bodies in the soft mass.

(4) The larger the mass the worse the shrinkage; no large filling should, therefore, ever be composed of fresh amalgam alone.

(5) Absolutely perfect results can very generally be got by using old standard amalgam heated and packed in small pieces, burnishing it well against the walls, but this is troublesome, and in some classes of cavity perhaps impracticable.

(6) In a large number of cases equally perfect results may be got with a mixture of new amalgam with old that has been heated to its softening point, and a beautiful finish can at once be got upon the plugs.

I am well aware of the very incomplete and imperfect nature of this communication, but it has seemed best to publish it even at this stage of the enquiry, for imperfect though it be, it represents the outcome of not a little time and a very large number of experiments.

I hope that it may contain, at least, useful hints, and that others who work upon the lines here laid down may soon test them and carry further the success which seems to promise.

I may mention that I have used the term shrinkage as covering also change of form, and I have not gone into much detail as to the actual experiments, as that would only be wearisome; I have given the results rather than the means by which I have been led to them.

As practical hints in using amalgams after this fashion, I have found in large cavities the use of a matrix invaluable; I find that the easiest method of manipulation is to rapidly burnish a small quantity against the walls, then to take a large piece which will fill up the bulk of the cavity, and to finish by the addition of small pieces. If during the accomplishment of this, the amalgam has set, heat the final portions just as though the whole filling were being made with old amalgam, and use hot instruments.

If the operator desires to use old amalgam for the whole operation, the best plan is to heat the whole lump in a spirit or Bunsen gas flame, and then lay it on a hot plate over the flame, so as to keep it soft. And as good results are only obtainable with a rapidity of setting which is rather inconvenient, it is necessary to dry and protect from moisture the cavity before mixing up or heating the amalgam mass.

Time alone can show whether amalgam so inserted will discolour a tooth, but the probability seems to be that a water-tight plug will not do

so. For it is a familiar fad that palladium, the only water-tight amalgam of which we have long experience, does not do so, notwithstanding that its sulphide is black, and is freely formed upon its surface.

I should add that there is a certain fickleness in amalgams which seems to preclude absolute uniformity of result, and I have been now and again disappointed with the outcome of a particular experiment. Still I believe that the methods here suggested will give a far higher average of success than those in ordinary use.

And whilst it is true that a filling which is not watertight to the fullest extent will often preserve a strong tooth in a healthy mouth for a long time, yet it stands to reason that watertightness is a great desideratum, and the fact that when an amalgam filling fails we so often find its whole bed softened, seems to show that its adaptation was less perfect than that of the average gold filling which fails.

Discussion.

Mr. Van der Pant asked Mr. Tomes what amalgams he used.

Mr. Mansbridge asked if Mr. Tomes attached any importance to mixing amalgam in the hand, and whether it could affect the ultimate result. Also, whether there was any disadvantage in squeezing out any excess of mercury before filling, or whether it was better only to use just the amount of mercury required.

Mr. W. Coffin asked if Mr. Tomes had been able to formulate any idea in his mind as to what really happened when an old, hard amalgam was melted by heat. He had spoken of its being "decomposed," by which he could not mean decomposed into its original constituents, otherwise, upon hardening again it would have to go through the same processes, whatever they might be, and the result would not be the very rapid hardening that they knew took place. There was, he presumed, a suspicion that amalgam consisted of one chemical compound between mercury and one or other of the metallic constituents more or less mixed, absorbing each other, or crystallising each other, and of course the idea would suggest itself that the so-called decomposition by heat was really a resolution into a new series of definite chemical compounds which either combined or re-dissolved and crystallised in each other with great rapidity. He had tried to make some investigations upon the point, but with very incomplete, puzzling, and wholly inconclusive results. But if they could be taken in a direction of separating the more fluid and the less fluid portions from each other upon melting the amalgam, one might arrive at some method of producing first the chemical

compounds and keeping them apart until they wished to produce the result that was obtained by heating. He imagined that by producing a liquid compound—and two or three were known to exist—a definite compound of mercury and one or other of the metals, they would be able to secure a perfectly definite result as to the final compound and its physical properties. At present the great difficulty was in getting always the same physical result in mixing amalgams, even with the greatest care and accuracy. The paper had been most suggestive, and was full of a number of points from which many of them would no doubt try to make new departures.

Mr. W. Hern asked whether the ratio of the surface of a filling to its depth made any difference in the contraction of the amalgam. It seemed that when one had to put in a shallow filling in a large area the edges of the cavity had not been so good after a lapse of time as with a filling which had been put into a cavity of considerable depth with a small area.

Mr. Beadnell Gill said that Mr. Tomes had stated that towards the end of his experiments he found a great many unaccountable failures. He should like to ask if he noticed whether he invariably mixed his amalgam in his hand after using the mortar, and if so, whether there was a difference in the condition of the hand on one occasion to what there was on another. He had noticed on some occasions when tempted in a hurry to rub the amalgam in his hand, that sometimes it yielded very good results packed as dry as he could possibly squeeze it in wash-leather with pliers. On the next occasion, having done exactly the same thing with exactly the same amalgam, he had found that it would not work. He put this down to the fact that his hand on the latter occasion probably had some moisture that was conveyed to the dry amalgam and brought about the failure. He had, of late years, invariably adopted the other practice, and had reduced the number of his apparent failures.

Mr. E. Lloyd-Williams said the thanks of the Society were due to Mr. Tomes, more especially because he had brought home to them the fact, which perhaps none had

fully realised, that under ordinary conditions, and even with the exceptional methods which had been referred to, such as those of Dr. Bonwill and Mr. Kirby, a very large majority of amalgam fillings in anything like large cavities would fail after they had been in the mouth four or five years. He heard a few murmurs behind him, and did not for a moment expect that members would entirely agree with him. There were no doubt other considerations which could not now be gone into, as to why a large proportion of those amalgam fillings which he had called "failures" still did duty in preserving the teeth. It was a long subject to go into, and he would not dwell upon it, but he was perfectly certain that any careful series of experiments would prove that a very large majority of amalgam fillings put in in the ordinary way would fail after the period he mentioned. He was therefore very glad that the subject had been brought forward, and having had the privilege of an early perusal of the paper, he had only as late as that afternoon tried a very small series of experiments, though in a very rough and ready way. Finding that Mr. Tomes advocated a plan of mixture of old amalgam, which was softened by re-heating and mixing up in a mortar with a mix of new amalgam, he took a good old specimen which he found in his drawer, a monument of somebody's skill, probably his own, which had failed, and failed very badly, and heated it up on a hot plate over a spirit flame. He had not the remotest idea what amalgam it was, but he added to it an equal part of a medium mix in a tolerably plastic condition of Flagg's submarine amalgam. He tried to get this into a cavity, as it was stated in the paper that this would not be a very difficult matter; but although he had two very tiny cavities in the surface of a molar, and although this operation was performed out of the mouth, he still found a great deal of difficulty in getting the two little plugs packed in before the amalgam set. In fact it was in a powdery condition almost before he got it into the tooth, but after it was in, and it was burnished down, the results seemed to be very good. The second portion of the same amalgam was heated up on a hot plate and meanwhile an ordinary mortar

was heated up. He took another mix of submarine amalgam, a little thinner than the last, mixing it in the hot mortar, and he certainly found that one had a much longer time to manipulate the fillings. He thought that for flush fillings that could easily be kept dry, a good deal of use would be found for this method of putting in amalgams, but he was not nearly so hopeful as Mr. Tomes appeared to be that contouring was to be done quite so easily. He believed that in cavities difficult to keep dry, and in inaccessible positions, it would be found extremely difficult to pack the amalgam carefully, even with the aid of a good matrix. Mr. Tomes had found some variation in his results. He (Mr. Lloyd-Williams) would like to suggest that perhaps there had been variation first of all in the quantity of mercury originally mixed with the amalgam; that secondly there had been a variation as to the temperature applied to the amalgam over the spirit flame; thirdly, that there might have been a variation in the quantity of mercury added to the fresh mix; and lastly, a variation in the temperature of the mortar in which the amalgam was mixed. No definite data had been given as to the amount of mercury used, the temperature at which the original amalgam was softened, or the temperature of the mortar in which the mass was finally mixed up, and it might perhaps be found by further experiments that these things bore a definite ratio, and that the results would be more uniform when the methods themselves were more uniform.

Mr. S. J. Hutchinson asked whether Mr. Tomes had tried the effect of using gold to absorb superfluous mercury. In a former discussion, Mr. Walter Coffin stated that his father had been in the habit of using old gold to absorb mercury, and when he could not get old gold he used new gold. Had Mr. Tomes tried this plan, and with what result? He (Mr. Hutchinson) had used gold and burnished the fillings very carefully afterwards, but he was ashamed to say he had not used bits of ivory, or ink, either Draper's Dichroic or any other form, to verify his experiments. He had tried using gold, both waste and new, for the purpose of absorbing superfluous mercury, and their efforts in that

practical direction would be considerably supported by any experience which Mr. Tomes could give them as to the use of gold for this purpose.

Mr. Robbins said he had faith to believe, notwithstanding all that had been said on both sides of the Atlantic, that amalgam was doing its work well if properly handled in the present day, in spite of the ink test. He would ask whether Mr. Tomes, in his experiments, used a good lining or a good pad of a mixture of oxy-phosphate and amalgam. In many cases that formed a splendid filling in fragile cavities, used alone, but it gave a better result when it was surfaced with amalgam. The experiments, so far as he could understand them from the paper, went to show that large masses of amalgam would shrink, and must always shrink if put in as they were at the present day. In that case, would not it be better not only to have the lining, which was simply a lining, but almost three-quarters of the cavity, filled with an oxy-phosphate or the combination method? He was very interested in the question put by Mr. Hutchinson, because for the last three years he had used, and thought he got some good out of the use, a method which had been described of using heavy gold foil, in conjunction with pressure, over the surface of an amalgam to absorb the excess of mercury. He had tried tin and had become disgusted with that, because they could never tell what was left behind. Taking up this idea, he had experimented in the mouth and out of the mouth in a great number of cases for the last three years and in private practice. He never now put in a filling of amalgam without using this method, getting the last third of his cavity filled with amalgam as dry as possible, building it a little in excess, burnishing it down hard, and then with a large, loosely rolled gold cylinder, held end on, exhausting all the surface mercury possible. Again he burnished and again used the Wolrab cylinder, the result, to his mind, being very satisfactory, with less failures. He would ask Mr. Tomes if he had used that method; and the globules of mercury spoken of as being visible under a magnifying power increased his boldness in asking that question.

Mr. Paterson said that reference had not been made to the practice of lining cavities with osteo made of the consistency of cream and upon that plugging with amalgam at first rather moist, finishing off, drying, and taking great care that in the plugging of the amalgam upon this cream oxy-phosphate, the mixture oozing from the sides of the cavity was carefully removed and fresh amalgam carefully burnished into the edges, and seeing that the superfluous mercury and amalgam were wiped off at the edge. He had recently seen a bicuspid with a distal cavity that was filled with amalgam by that method four years ago, that was to say, the cavity was lined with creamy osteo, and the amalgam plugged in upon it, finished up in the way he had mentioned, and now at the end of four years, with the exception of a little roughness on the surface of the amalgam, which was easily made right, that stopping was uncommonly good. He thought that no cavity should be filled with amalgam throughout; he believed in lining all cavities with osteo. The point with regard to the staining of the teeth was very interesting, because cavities lined in that way certainly did not stain. The only point on which one was a little doubtful was whether there was shrinkage of the amalgam round the edge, or whether the oxy-phosphate did not hold the amalgam and so obviate shrinkage. That was the point he had to find out, and if he could only get the tooth out to which he referred and which he had seen that day, and submit it to Draper's ink and test it, the result would be most interesting. The question of staining was very important, though, as had been said, it was doubtful to what it was due. Mr. Tomes seemed inclined to believe that it was due to moisture. In some cases, although leakage must have gone on, there had been no staining in some teeth, whereas in others where no eburnation had taken place great staining had occurred. That did seem to lend some weight to the idea suggested by Mr. Tomes. With regard to the use of old amalgam, he had often seen that suggestion carried out. He remembered an old practitioner who, in every tooth that he removed containing a black amalgam, used to break up the tooth and

put up the amalgam into a bottle, and he invariably used the old stuff mixed sometimes with a little new. He believed in it as a much better filling, having less shrinkage. With regard to the standard amalgam, which he had used for the last five years, he had tried heating it, but had never been able to make anything out of it in the way of stopping. It was very difficult to bind up. He did not know how Mr. Tomes managed it, but the setting was extremely rapid, and unless it was mixed with some fresh amalgam and worked up in that way he did not know how it could be got into a tooth at all. Certainly it could not be worked on the plan of using osteo to start with.

Mr. Andrew said that, in making a bar of amalgam out of the mouth, if the lower half was packed soft and the top with hard, dry amalgam, they got a warping in one direction. If it was done the reverse way, packing the lower half hard, and the upper half soft, they got a warping in the opposite direction, and that opposite direction was the direction they usually got in the mouth. The result was, if they had the soft amalgam below, the corners rose; if they had the dry above, the centre rose. It was the dry part above which they had in the mouth, and then the centre would rise and draw away from the edges a little bit.

Mr. Schelling said some time ago he had the pleasure of seeing an amalgam filling which had been in a tooth for seventy-three years, and it appeared to have done so perfectly well that it would go on for some years more.

Mr. Tomes, in reply, said Mr. Lloyd-Williams had mentioned the difficulty of getting time enough to manipulate, even with a mix of new amalgam. If they used equal parts of new and old amalgam, the mix of the new must be very decidedly more plastic than one would ordinarily use in making an amalgam filling. Mr. Mansbridge asked if the amalgam was mixed in the hand. In nearly every instance he mixed his amalgams, when experimenting with new amalgams, by shaking them up in a tube, and then with a very brief rub in the palm of his hand. As to squeezing, in the majority of his experiments the original proportion of

mercury added was not such that anything could be squeezed out, or very little, even if it were squeezed with the wash-leather and pliers. Where he was not using old amalgam re-heated he had the amalgam pretty dry to start with. In some of the experiments, particularly after finding the beads of mercury, or what looked like mercury, upon the surface of the setting amalgam, he did try mopping them with gold. He tried those which were mopped with gold both as to water-tightness and in regard to the beading, but although the beading might be temporarily got rid of it would re-appear in amalgams set in the ordinary way. He sometimes used heavy gold, but did not find it so good an absorbent as cylinder gold or several bits of thinner gold. It did not seem to amalgamate quite so readily. He took several fillings immediately after they were packed into the hole, lightly scraped the free surface, and the surfaces which had lain against the walls of the cavity. He then cut the filling in two and scraped something from the middle. He found on the rough analysis obtainable by igniting the two sets of scrapings in a porcelain crucible, that there was a very much larger proportion of mercury in the scrapings which came from the surface than in those which came from the interior of the mass, the masses being packed by the Bonwill method. There was a large difference. He tried the same experiment, waiting until the plug had set, again scraping the surface and the interior with the idea of seeing whether the mercury was uniformly distributed through the mass, but still found more mercury in the surface than in the interior, though the excess was not so great as before the filling had set. This very likely accounted for the warping referred to, which was probably due to the re-arrangement of the mercury in the interior of the mass. Mr. Coffin had propounded an exceedingly difficult question as to what happened on re-heating and in the re-hardening of the amalgam. He did not know in the least. When he said it would decompose, he had in his mind the idea, which was a loose one, not based upon any very accurate knowledge, that when an amalgam was mixed they first of all got a solution of constituent metals in

mercury, and that an alloy more or less perfect forms in solidifying. His notion would be that in the heating of those amalgams they might break up the chemical compound and again get a solution in free mercury as with other metals, but it was a thing which it would be very difficult to investigate. Mr. Hern asked whether any difference was noticed in the shapes of the cavities—the ratio of the surface to the depth. He did not mention that, because if Mr. Hern would experiment he would find he would have to look very long in order to establish any point with absolute uniformity. His (Mr. Tomes') experiments were made in holes of uniform depth and diameter, and he could state nothing as to the ratio of surface to the depth. Mr. Beadnell Gill asked whether in his latter experiments he mixed the amalgam with the hand. It was quite likely that the discrepancies found in his experiments were due to something of that kind. His habit, as a rule, in mixing old and new amalgam was to rub it up in a warm mortar, quickly transferring it to his hand, just giving it a very brief rub, and then packing it in. There was very little rubbing up in the hand on account of the shortness of time. Mr. Lloyd-Williams suggested as another reason for the discrepancy, that there might have been great variation in the quantity of mercury contained in the pieces of old amalgam. In some of his experiments he used pieces of old amalgam about which he did not know much, but in the majority he used pieces of amalgam of his own mixing, belonging to this series of experiments which, in a large number of instances, had weighed proportions, and if they had not, were pretty uniform. Mr. Paterson referred to lining cavities with osteo-plastics. He did not experiment in that direction, because they knew quite well that if a cavity was lined with an osteo-plastic it would be water-tight as far as the osteo-plastic was concerned. He had stated in his paper that no very large fillings should be made, at all events not with new amalgam. If they were going to fill a cavity with osteo-plastic instead of merely lining it, it should be mostly filled with osteo-plastic, and the amalgam should be regarded merely as a protective agent to protect

the plastic from chemical changes, and therefore the amalgam would be very much less in quantity than the osteo-plastic. In that way they could make water-tight fillings. The difficulty was to be sure that the osteo-plastic was quite protected. He did not think that the amalgam mentioned by Mr. Paterson would set quickly enough to give the best results with regard to the contracted edge. Amalgam, to be most advantageously used, should be set as soon as ever it could be packed in, and if they packed pretty hard, and burnished then and there, that burnish would remain. They would get as bright a burnish upon fillings put in in that way as they could by polishing and burnishing on another day. As to the amalgam that he used, it was principally Foster Flagg's standard amalgam, though he had used others.

The PRESIDENT said it only remained for him to offer the thanks of the Society to Mr. Tomes for his paper, and also to Mr. Mansbridge and Mr. Andrew for their casual communications.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

February 4, 1895.

MR. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

PRESIDENT, IN THE CHAIR.

THE Minutes of the last meeting were read and confirmed.

The following were balloted for and elected non-resident members of the Society:—ERNEST H. A. MACKLEY, L.D.S. Eng., 74, St. Giles Street, Norwich; THOMAS LLEWELLYN NASH, L.D.S.Edin., 39, Church Street, Inverness; WILLIAM SIMMS, L.D.S.I., 2, Bury New Road, Manchester.

The following were proposed as resident members of the Society:—FRANCIS MARK FARMER, L.D.S.Eng., 17, Great Marlborough Street, W.; HARRY SYMES PRIDEAUX, L.D.S. Eng., 41, Wimpole Street, W.; FREDERICK JAMES FRANKLAND ROOKE, L.D.S.Eng., 42, Kensington Gardens Square, W.

The following were proposed as non-resident members of the Society:—J. MAIN NICOL, L.R.C.P.Lond., M.R.C.S. Eng., L.D.S.Eng., 2, Clarendon Road, Leeds; GEORGE ARTHUR PEAKE, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng., Alma House, Cheltenham; FRANK C. PORTER, L.R.C.P. Lond., M.R.C.S.Eng., L.D.S.Eng., 12, Oxford Street, Nottingham; GEORGE NASH SKIPP, L.D.S.Eng., Sale, Cheshire.

The Librarian reported that he had received, in addition to the several journals, periodicals and exchanges, *The Medical Magazine* for January, 1895.

The Curator said he had received a model containing a supernumerary tooth, conical in shape, and occupying the position of the left upper incisor. Neither the situation nor shape were very uncommon, but it was an interesting specimen nevertheless. It was taken from a boy aged 8 and was presented by Mr. W. H. Pidgeon, one of the students at the hospital. A lower lateral incisor taken from a boy aged 14 had been presented by Mr. W. Rispin, one of the house surgeons of the hospital. The crown had been fractured transversely, killing the nerve, and the pulp cavity was very largely opened. Food getting in, the boy was in the habit of whittling a match down to a point to pick it out with. The result was that eventually he broke the match into the tooth. It worked further and further down the root canal, ultimately penetrating through the apex, and producing an alveolar abscess which lasted three months. At the end of that time the tooth was extracted at the Dental Hospital, and the piece of match about one-eighth of an inch in length was, when seen, projecting through the apical foramen. About a year ago a somewhat similar specimen was presented to the Society by Mr. W. A. Densham, a former student of the Dental Hospital. Unhappily, the piece of wood had been broken off before the specimen came into his (Mr. Bennett's) hands, but the remains could be seen in the root canal. In the present instance the piece was preserved intact and would be a valuable addition to the Society's collection. A very valuable specimen had been presented by a non-member of their profession, but a gentleman who took a great interest in the Society and its museum. He referred to Mr. R. J. Larking, of Melbourne, who had already sent a good many valuable donations. He (Mr. Storer Bennett) had mentioned to him that the museum possessed a female dugong skull, but not a male, and that the only specimens they had of the male dugong consisted of two tusks. It would be within the recollection of the members that the

tusks of the female dugong were functionless, never being erupted, and unlike those of the male, they terminated in a large boss at the distal extremity, while the teeth of the male were hollow at the distal extremity, as were all other teeth of persistent growth. Mr. Larking had now sent a skull of the male dugong, with the tusks perfect, forming a very valuable addition to their collection, and one for which they were greatly indebted to him. Mr. Charters White had presented a model showing the apex of a canine erupting in the palate. It was taken from a lady aged 55. She had worn a plate for a long time with comfort, but eventually "a pimple" formed in the palate, and later on the apex of the canine came through. In connection with this case he might mention an interesting one that occurred in the Dental Hospital only a few months since. A woman aged 23 came, requiring upper and lower plates. The wisdom teeth were unerupted. After wearing the plates for two or three months she came back saying they caused extreme pain at the back of the mouth, and on examination it was found that the four wisdom teeth were beginning to appear, no doubt due to the pressure caused by the plate. That, of course, was not absolutely identical with the present case because, apparently in this instance, the plate had been worn for a much longer period. Mr. Charters White, with his usual indefatigable energy, had made a section through the root and had also presented photo-micrographs of a transverse section about half way down the root, showing a very large amount of cementum, and a very small pulp canal. The Society was very much indebted to Mr. Charters White for this valuable contribution.

The President said the Council had nominated Mr. Stocken, a very old member and a vice-president, for election as an honorary member.

The resolution was carried by acclamation.

Mr. W. E. Harding said in practice they met with a large number of cases of pulps decomposing with cavities in such a position that if the root canals were small and indistinct they could not be thoroughly cleared. The old

method adopted in such cases was either extraction or rhizodontrophy. Mr. Coleman, many years ago, suggested the use of arsenious acid applied to the pulp chamber. That treatment had a measure of success, but it had been almost entirely discontinued for various causes. He (Mr. Harding) had, for a number of years, used a 10 per cent. solution of bi-chloride of mercury in absolute alcohol. A piece of cotton wool or other fibre was soaked in the solution and placed in the pulp chamber. The absolute alcohol was made to evaporate with the hot air syringe and the cavity closed. In other cases where one could get a little way up the canal he worked a little of the strong solution into the canal itself, drying as before. This was exceedingly successful. At the Dental Congress at Chicago in 1893, Professor Miller read a paper on this subject, in which he advocated the use of a pellet formed of bi-chloride of mercury combined with thymol, one-tenth of a grain of each. He (Mr. Harding) found the one-tenth was really more than was required, and that pellets containing one-fifteenth grain of each were sufficient. He had treated about 200 cases in this way, and had very few returns. Some had had further trouble, abscess and so on, but by far the larger number had been very successful. He did not advocate this treatment for any cases in which the canal could be got up, for he was an exceedingly strong advocate for filling all root canals where it was possible, but there were a large number of cases in which, from the position of the tooth, and the shape or size of the canal, it was almost impossible to get up, and for such cases he found this treatment very valuable. Of course the time, about eighteen months, was hardly long enough to give a good test. He had an upper molar in his own mouth in which the palatine canal was filled with gutta-percha, but the other two roots were so small and tortuous, that his colleague, who was filling the canals, could not get up, and consequently he put half of one of those pellets over the mouth of the two buccal roots. The tooth was filled with amalgam and had been perfectly comfortable for about eighteen months. Bi-chloride of mercury stained the tooth and

therefore should not be used anywhere near the front of the mouth. Indeed, it was a mode of treatment never wanted for the incisors or canines, but was only necessary for molars and teeth in an awkward position.

Mr. Betts said he had recently been rather disillusioned with regard to the solution of bi-chloride of mercury in alcohol. An eminent chemist had informed him that after heating for a short time, the bi-chloride became a mono-chloride. Therefore, when one spoke of putting bi-chloride up the root of a tooth in alcohol solution it was not exactly so. The bi-chloride became a mono-chloride and there was a chloride of ethyl formed.

Mr. Gartley presented a molar tooth with very twisted roots, exhibiting in a practical way the difficulties of root filling.

Dr. J. E. Grevers, of Amsterdam, gave the following communication on "Hypoplastic Teeth," his remarks being illustrated by a series of lantern slides:—

I have to commence by asking your indulgence for the unsatisfactory state of the few slides I have to show. The art of photography I have just commenced to learn, and the photographs which will be shown to you this evening are the first that I ever made.

In 1881, when the Seventh International Medical Congress was held in this city, a paper was read in the section for diseases of children, by Dr. Magitot. The title was "Erosion," and Magitot defended in this paper the theory that erosion of the teeth was due to eclampsia infantum exclusively.

Congenital defects of the enamel, or, as the French and German writers call it, "erosion," was first mentioned by Fauchard. Bunon gave us, however, a full description of its microscopical appearances and of its etiology. Microscopically it has been investigated by Wedl, and in his standard work, "The Pathology of the Teeth," some very valuable points are brought forward. But the description given by Wedl was far from being complete, and a further investigation was desirable.

O. Tsigmondy, of Vienna, has recently published the results of investigations which have added materially to our knowledge. These results are identical with mine, which I verified by a personal visit and inspection of his microscopic slides, a few of which I will presently show you.

One word more as to the names under which this pathological condition is known and described. Various names have been given—Erosio, odontopathie atrophique, rachitic, scrofulous, mercurial, syphilitic, honeycombed and atrophic teeth are the best known. I need not dwell here at any length on the impropriety of most, if not all, of these names. Erosio and atrophia are the most frequently met with, but both are insufficient. Erosio, derived from erodere, means a gnawing away, and erosi dentes means, with the old writers, caries or hollow tooth. It is true that teeth so affected have the appearance of having been gnawed away, and clinically we could agree with the name, but pathologically we must reject it. Atrophic teeth, as I understand these teeth are called in England, cannot satisfy us either.

Ziegler in his work on "Pathological Anatomy," vol. i., p. 116, defines atrophy as follows:—"Under pathological conditions retrogressive metamorphoses frequently appear which are analogous to the physiological metamorphoses leading to conditions that are denoted as atrophia, and appearing to the investigator as a diminution of the organs or disappearance of single tissue elements."

A few lines previously we read:—"Retrogressive metamorphosis in general is characterised anatomically by a diminution of an organ; microscopically by a diminution and final disappearance of the constituent elements, namely, of those that are specific to the organ in question."

In an earlier edition of the above-mentioned work (1887), Ziegler expresses himself as follows:—"In the last (atrophia), we have not so much to do with an original defective formation as with a retrogressive metamorphosis of normally laid out and formed parts."

Now it is clear, gentlemen, that to the congenital defects

of the enamel now under consideration we cannot apply the word atrophia. It cannot be said that we have here to do with a normally formed tissue, although it may safely be presumed that the enamel organ was normally laid out.

In Section 37, page 113, seventh edition of the same book, we find words which may with more propriety be applied to the enamel defects. Ziegler says here: "If entire parts of the body or systems of organs, or a single organ, or parts of this organ have through external or internal causes been checked in their development, and therefore defectively formed, and abnormally small and defective, we call this hypoplasia; if some parts fail entirely, aplasia or agenesia."

It will be clear to you, gentlemen, that I do not adopt the definition of Lancereaux as given in his "Treatise on Pathological Anatomy," vol. i. Hypoplasia he defines as an alteration which has its starting point in a lowering of the nutrition of the tissues, and has as its characteristic an infiltration of the histological tissues by substances that trouble and impede their functions. At first I had adopted the word aplasia, and called the congenital defective teeth, aplastic teeth. Later I changed this word to hypoplastic teeth, and found myself supported by Tsigmondy and Cunningham, who in 1893 proposed to adopt this last word.

As the forms under which hypoplasia may make its appearance in the teeth are various, I have adopted the following names:—(1) hypoplasia cupuliformis; (2) hypoplasia cuspidiformis; (3) hypoplasia sulciformis; (4) hypoplasia semilunaris or Hutchinsonian teeth.

Microscopically the three forms first mentioned show a distinct line running from the outer surface of the enamel to the periphery of the dentine, forming with the latter an angle of 30 to 35 degrees. In general the course is identical with or parallel to the striæ of Retzius, and they behave under transmitted light, and with incident light thrown by a bull's eye condenser in the same manner as the striæ of Retzius—that is to say, they appear by transmitted light brown, and by incident light white.

You all know that according to the researches of v. Ebner of Vienna, these appearances are due to spaces between the enamel prisms, which contain air.

We therefore must look upon the line as being an exaggerated space, not between, but in the body of the prisms, a condition which finds its origin in the checking of the calcification of the prisms. This checking of calcification may be of a very short duration, and then show itself as a hypoplasia cupuliformis or sulciformis, or of a long duration and then may be diffuse, or take in one-third or one-fourth of the entire length of the crown of an incisor.

Mr. F. J. Bennett said with regard to the specimens just exhibited, and for which the Society must be very grateful, if he had followed the point of Dr. Grevers' remarks, it was that in these defective teeth the irregularities followed the line of development or growth. Dr. Grevers appeared to claim an originality in his explanation of this, but he (Mr. Bennett) would point out that they found in "Salter's Surgery" a full description and drawing of this process, showing that Salter had arrived at this same conclusion many years ago. He called them the "incremental lines," and he not only described them in the dentine but also in the enamel, showing most distinctly what Dr. Grevers had pointed out, that the irregularities followed strictly the line in which the formation and development of the tooth took place. He would commend Salter's work to Dr. Grevers' notice, because they must claim an English origin for this idea.

Mr. Cunningham protested against the statement made by Mr. Bennett, and would undertake to say that neither Dr. Grevers nor Dr. Tsigmondy would have put forward before a scientific society, as original, something that had already been written by Salter. He believed that those gentlemen were equally acquainted with Mr. Bennett with the incremental lines of Salter, and he defied anyone to show from Salter what had been shown on the screen that evening. It was quite true that those pathological lines did coincide

with the so-called incremental lines of Salter, just as they also coincided with the lines of Retzius, but they could understand and differentiate between them. The work brought before them by Dr. Grevers was, he would say, advisedly a work of augmentation, and work that had never been shown before the Society previously.

Mr. Baldwin said the Society was very much obliged to Dr. Grevers for introducing this classification, which he took to be certainly original. Did he understand Dr. Grevers to apply the term erosion to the particular development? Here it had always been usual to restrict the term, not to congenital defects, but to defects acquired in perfectly well formed teeth—defects of a peculiar character simulating a fine file cut, generally at the neck of the tooth, but also appearing at other points upon the tooth surface in which loss of substance could not be explained by the ordinary effects of friction but were very obscure as to their cause.

Mr. Mummery thought they were rather confusing the lines of incremental growth, as shown in Salter's book, with the lines of defective development. The lines shown by Dr. Grevers were not lines of ordinary incremental growth: they were lines of arrested development and reformation.

Mr. F. J. Bennett explained that what he intended to say was that the defects strictly follow or revert to the lines in which growth takes place. There was an arrest of growth and the irregularity followed nothing but the line which growth would take.

Mr. Mansbridge asked how the slides were mounted. They were really very beautiful specimens, being so very transparent.

Dr. Grevers said, in reply to Mr. Bennett, what he would have said had been exactly expressed by Mr. Cunningham and Mr. Mummery. Salter's book was not unknown to him, and if Mr. Bennett referred to it he would find a picture of the development, but he would not find the lines he (Dr. Grevers) had shown in his specimens.

The incremental lines were well known to him, but he had not gone very deeply into details in his paper, owing to the shortness of time at his disposal. In reply to Mr. Mansbridge, he said the preparations were mounted in Canada balsam. He hoped at some future time to bring forward a further communication on this subject.

The PRESIDENT said he was sure the members would be very happy to give Dr. Grevers an evening for the purpose.

Hints on Photo-micrography.

By J. Howard Mummery, M.R.C.S., L.D.S.

Mr. President and Gentlemen,—The communication which I bring before you this evening can perhaps hardly be called a paper, but may be better described as some practical hints on photographing with high powers of the microscope.

To those who are already proficient in the art I must apologise for what may seem to be too elementary in my remarks. There may, however, be some among our members who may be stimulated to take up this most useful and fascinating pursuit, and to these a short explanation of the difficulties met with, and the means of overcoming them, by one who has suffered, may be acceptable.

Photo-micrography, as it is not too euphoniously called, is a science (for such we may now term it) of quite recent development, but it has already been of immense value in many departments of scientific study. There can be no doubt of the educational value of the photo-micrograph, and no course of lectures is now

considered complete that is not illustrated by lantern slides.

Photographs are of great value as a check upon observation; they keep drawings within bounds, and do not admit of quite such a play of the imagination as was frequently seen before the days when the camera was called in to assist the microscope.

While, however, fully recognising the value of the photograph in demonstrating minute structures, I do not think it is able to entirely replace the coloured drawing, but as a check upon it it is invaluable, and it is highly desirable that all papers on histological research should be illustrated by both photographs and drawings. This has been excellently done in a recent publication by Dr. Carl Röse and Dr. Geysi, of Zurich, illustrating the histology of the dental tissues, they having published the photograph and an illustrative lithograph side by side.

While the drawing represents the appearance of the tissue under examination as seen through the microscope in slightly different planes, the photograph only accurately represents one plane.

There is one point in this connection on which I would lay great stress, and that is that the photograph should not be touched up in any way, either upon the negative or the print. As soon as this is done a suspicion is thrown upon

its accuracy, and its value as a check upon observation is completely done away with.

Many collateral branches of knowledge bear upon the subject we are discussing to-night.

The great and rapid advances in the science of bacteriology made during the last ten years have greatly stimulated photo-micrography, as the minute organisms with which this new science is concerned are represented by photography with an accuracy and clearness not otherwise obtainable.

Another important discovery, that of isochromatic or orthochromatic plates, has been an excellent aid to the photo-micrographer.

These plates give the correct colour relations of the object in light and shade, and a moment's reflection will enable anyone to see the great value of this in photographing stained preparations. For instance, while formerly a yellow, from its weak effect upon the photographic film, came out black, or nearly so, a properly prepared orthochromatic plate (with the addition of a coloured light screen) renders it light in the resulting print, *i.e.*, in its proper shade relations to the other colours of the spectrum. Blue, again, which to the eye appears to be a dark colour, is rendered as white upon the ordinary photographic plate (blue containing a very large proportion of the chemical rays of the spectrum); a

colour-corrected plate reproduces the blue parts of the objects as dark in the resulting print.

I cannot, however, do more than touch upon this question of orthochromatic plates, as it would occupy too much of our time.

Another very important factor concerned in the recent advances in the art is the introduction of the new lenses; first, the water and oil immersion lenses, and more recently the apochromatic lenses of Zeiss; both these improvements greatly increase the light admitted to the object. As I have described elsewhere and perhaps may be permitted to repeat here, in the immersion lenses, instead of the object being viewed through a layer of air, a drop of fluid is placed upon the cover glass, and the lens is brought into contact with this drop, so that the rays passing through the object from the source of illumination, traverse the fluid before entering the lens. The optical effect of this arrangement is that rays which, following the laws of refraction, would have been diverted to such an extent in air as to pass outside the front lens of the objective, are made to pass into the lens and assist in the formation of the image.

While the rays which pass from the object into air form an angle of 120°, those traversing water form an angle of 82°, and when passing through cedar oil an angle of 69°. It will thus be plainly seen what an advantage is gained by

the employment of these substances; we have a much increased illumination, more rays being collected into the lens, and an increased working distance; that is, for the same magnifying power, the front lens of the objective is at a great distance from the cover glass.

But the greatest stride in microscopic optics dates from 1886, when the firm of Zeiss, of Jena, introduced the so-called apochromatic lenses. Before the introduction of these lenses, a sharp image in any optical system could only be obtained with one portion of the spectrum, the other portions giving images not absolutely clear, but all more or less blurred. The apochromatic lenses give an image almost equally sharp with all the colours of the spectrum. In the old achromatic objectives the colour correction was only made for one portion of the area of the lens, so that towards the margins, and also at the centre, it was imperfect, but in the apochromatic lenses the colour correction is made equal for all portions of the area of the lens. Again, whereas in the older objectives only two colours of the spectrum were brought to one point, in the apochromatic system these colours are brought to one point. A special kind of glass in combination with fluorspar is employed in these lenses.

The effect of these corrections is practically

to abolish colour in the microscopic image; we obtain an increased concentration of light and a greater range of magnifying power with the same objective, as very high eye-pieces can be used with them without detriment to the image.

Special eye-pieces are used with these lenses called compensating oculars, and their use is rendered necessary by the fact that all lenses of high aperture, owing to their hemispherical fronts, magnify the blue more than the red; an eye-piece is accordingly used in which the opposite error is introduced, the red being magnified more than the blue, and consequently with these eye-pieces the image is free from colour up to the margin of the field.

It will be obvious that for photographic purposes these lenses are invaluable, because, combining as they do the chemical and visual rays of the spectrum in one point, the focus of absolutely clear vision is also that of chemical sharpness, and the image, as focussed to the eye, will be exactly reproduced on the sensitive plate.

There are many excellent workers in this art, both in our own country and abroad; among the most prominent of the pioneers in this field are Dr. R. L. Maddox, to whom we are indebted for the invaluable suggestion of gelatine as a base for the photographic film; Dr. Woodward, in America, who produced beautiful results

before the introduction of the new lenses; Dr. Neuhauss, in Germany, whose photographs of flagellated organisms are well known; and in our own country Mr. Andrew Pringle, whose beautiful work with high powers is familiar to us all; his photographs of dental caries we have all admired on this screen. The work in this department of our friend and former President, Mr. Charters White, is also well known to us, and his excellent photographs of dental and other tissues.

In taking photographs with low powers of the microscope, no great difficulty comes in provided the specimens chosen are suitable for the purpose, but the photography of objects such as bacteria, with high powers, is a matter requiring great patience and perseverance, and it is in obtaining good results with a magnifying power of 1000 and over that the utmost refinements of the art are called into play.

An expensive and elaborate apparatus is not necessary in order to obtain good results.

Dr. Neuhauss of Berlin, whose photographs of bacteria are justly celebrated, worked with an ordinary bellows camera which he had himself adapted to the purpose, and an erection of boxes on which he placed the microscope, making the connections with cardboard adapters, and obtaining his illumination from an ordinary round-

wicked Argand oil lamp. There is no doubt, however, that a special apparatus has many advantages; such a one as I have here to-night, although not nearly so elaborate as many that are now made, enables one to do the work with a minimum of fatigue, and ensures rigidity, which is a very important point. The first desideratum is of course a very firm and solid base-board, not supported on legs attached to it, but on a very firm and solid table, and for high power work, wherever possible, on a cemented basement floor, for vibration is the great bugbear of the photographer.

The bellows should be capable of considerable extension, and blackened cardboard diaphragms inserted at intervals to cut off all reflected rays; a small amount of reflection from the interior of the bellows or of the microscope tube will give rise to ghosts in the negative—an unpleasant kind of phantom which generally manages to blurr the one important part of the negative. The photographer with the microscope will find there is a perversity in things inanimate, and a persistent tendency to thwart him which he could hardly have given them credit for. It is always the best negative that breaks itself—I will not say gets broken, for it seems to go out of its way to court destruction.

To prevent these ghostly reflections, a careful

examination of the interior of the camera should be made every now and then, and the slightest reflecting surface should be touched with a dead black paint; the best I know for this purpose is the "flat black" sold by Messrs. Naylor, of James Street, Oxford Street, a paint which appears to be absolutely without lustre. The microscope tube should be lined with black velvet. Any microscope will serve our purpose that is rigid in the horizontal position, and nose pieces should not be used to carry the lenses, but they should be screwed directly into the microscope body to ensure accurate centering.

A good substage condenser is a very important part of the apparatus, and the high angle achromatic Abbé condenser of Zeiss is one of the best to employ, as it transmits a very large cone of achromatic light. It should be furnished with an iris diaphragm. If an oil lamp is employed as the radiant, a bull's-eye or similar condenser should be placed immediately in front of the flame, so arranged as to convey parallel rays to the back of the substage condenser. I prefer a large flat wick lamp, with the edge of the flame towards the object, not having had much success with the round wick employed by Dr. Neuhauss.

A means of using the fine adjustment while focussing at a distance is of course requisite. In

the apparatus here shown this is obtained by a brass rod covered at one part with india-rubber; this bears upon a friction wheel, and by means of a cord and pulleys, works the fine adjustment. There are of course many modifications of this focussing apparatus.

The portion of the apparatus on which the microscope and lamp are placed is pivoted so that it can be rotated and the adjustments made while the operator is in a sitting position, before it is returned to its place in front of the camera.

For use with the orthochromatic plates, coloured glass screens are required—yellow glass of different shades being the most generally useful; a colour called signal green is valuable in photographing certain shades of red.* Many prefer to use fluid light filters instead of glass. A solution of picric acid forms an excellent pale yellow filter, and different strengths of a solution of bichromate of potash are useful when darker tints are required.

If sunlight or the lime or electric lights are employed, Zetnow's light filter is most valuable. It consists of dry nitrate of copper, $2\frac{1}{2}$ ounces, dry chromic acid, 2 drachms, water, $4\frac{1}{2}$ ounces.

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* If the glass is placed well behind the microscope it need not be worked glass, but if placed within or near the sub-stage, it must be optically worked; the two surfaces must be quite parallel.

If the lime light is employed, of course the exposure time is very much shortened, but the eyes must be protected in focussing with dark spectacles or a deep coloured glass placed below the stage.

I think perhaps our purpose will now be better served if I describe the steps to be taken in making the adjustments and exposure for photographing an ordinary object—first, supposing we are using a low power such as an inch or half-inch, and secondly, with a high power such as a one-twelfth oil immersion at such an extension as will give a magnifying power of 1,000 diameters.

It is not every good microscopic object that is suited for the purposes of photography. An object showing great differences of density in different parts is particularly unsuitable, as by the time the thicker parts of the specimen are sufficiently exposed the thinner parts are hopelessly over-exposed.

We will suppose, however, we have chosen a good thin and even section of dentine or enamel, unstained. The first thing to do is to sit down to the turn-table, and having placed the eye-piece in the tube of the microscope, accurately adjust the centre of the flame to the centre of the field of the lens, using the flat surface of the flame, then place the object on the stage and carefully choose the best part of it, seeing that the lighting

is fairly even. Removing the eye-piece we return the turn-table to its place, allowing the tube of the microscope to pass within the brass flange on the camera without touching it. A focussing screen carrying a piece of white cardboard is now placed in the camera—the little door at the side is opened, and again sitting down by the microscope, the projected image is focussed with the coarse adjustment on the cardboard. We now judge if the field on the paper is evenly lighted, and probably find it advisable to adjust the bull's eye condenser near the flame so as to diffuse the light evenly over the object and its projected image.

This method of preliminary rough focussing saves a great deal of unnecessary fatigue in focussing through the screen at the back of the camera, but once having obtained the focus on the card, we close the side door and put a plate-glass screen in its place; a very little adjustment with the focussing rod and fine adjustment with a focussing lens will give the true focus of the object.

Removing the screen we substitute the filled dark slide, and after closing the shutter of the camera, pull out the slide and all is ready for exposure. Being sure that the apparatus is free from vibration we open the shutter and give the exposure—such an object as this with a good light would require perhaps from ten to fifteen seconds.

If, however, we wish to photograph a slide of bacteria and magnify it a thousand times, we shall have to take further precautions, and as such a preparation will have been stained with an aniline dye, colour difficulties will have to be met. To obtain a negative magnified to this extent, a one-twelfth oil immersion lens, preferably an apochromatic lens of high angle, should be used in combination with a special projection eye-piece, although of course, by greater extension of the camera, an eye-piece can be dispensed with.

Place the substage condenser in position and with a half-inch lens focus down upon the condenser until the little hole in the centre of the cap is exactly in the middle of the field of the lens, then carefully centre the aerial image of the *edge* of the flame which is projected by the lenses of the condenser. Replace the half-inch by the one-twelfth and again see that condenser and flame are properly centred, as although it is much easier to make these adjustments with the lower power the optical centre of the immersion lens may not quite correspond with it. In photographing a coloured preparation such as this, almost the full aperture of the condenser should be used—that is, the iris diaphragm should be nearly open to its full extent.

Another point is that the angle of aperture of the condenser should be equal to that of the

objective if we wish to take full advantage of the latter.

The condenser and light being now centred, place the object upon the stage and focus down upon it. This being a coloured object we shall have to employ a colour screen, and if the stain is methyl violet or gentian violet a pale yellow screen will suit it best. The turn-table is now adjusted, the paper screen placed in position and viewed through the door—a rough re-adjustment of the focus with the coarse adjustment will be found necessary, and it must be seen that the edges of the disc are quite sharp; if not, the screw collar on the eye-piece must be shifted and an increased and even illumination obtained by means of the bull's eye as before.

In focussing with the fine adjustment the glass screen may now be dispensed with and the focussing glass, which may be either a Ramsden eye-piece or a spectacle lens of 8-inch focus as recommended by Mr. Bousfield, used upon the aerial image in the camera. With a long extension of the camera, the rays which form the image being nearly parallel, there is a considerable range in which the focus is quite sharp, and consequently we can dispense with the glass screen. This is often very convenient, as one's eye is not disturbed by any markings upon the surface of the glass.

If using a short extension, however, the rays

being more divergent, the region of sharp focus is much more limited in extent, and it is necessary to use the glass screen in order to insure that the sharpest focus of the object shall be exactly in the plane of the sensitive plate. We now close the shutter, examine again to make sure the focus has not altered, and very carefully insert the loaded back—open the shutter and expose. In this instance the exposure would be about six minutes, but the time must, of course, depend very much upon the nature of the slide and the depth of tint of the coloured screen.

All who undertake high power work must expect much disappointment—many negatives turning out failures, and only now and then does one secure a negative whose qualities are thoroughly excellent in every respect.

Developing a plate taken with a high power requires considerable experience and judgment. I have tried a great many developers, as hydroquinone, eikonogen rodinal and metol, but, like many others, I find I get the best results with pyrogallic acid and soda and more control of the development, adding fresh soda by degrees as the image appears, and always using a small quantity of a 10 per cent. solution of bromide in the developer.

If the negative is found to be clear, but underdeveloped, as is very often the case, it being particularly difficult to judge the density of a

photo-micrograph before clearing, it may be intensified, and I have obtained excellent results with the ordinary mercury and ammonia intensifier, being very careful to remove all traces of hyposulphite before placing in the sublimate solution and washing very thoroughly before applying the ammonia. If the negative is a little veiled, it is better not to try to intensify, but one can often procure a very satisfactory lantern slide from such a negative by a contact print with a weak light.

There are many excellent makes of lantern plates, those I have used lately being the special Ilford and the Imperial plates, developing with hydroquinone, to which is added a few drops of bromide. To obtain a perfectly clear background, which greatly adds to the beauty of the slide, I pour on and off two or three times, as recommended by Mr. Pringle, a solution of hydrochloric acid in water (about one part to eight) and then thoroughly wash.

For printing I prefer any of the gelatino-chloride papers, as they give excellent detail, glazing the surface by squeezing on to highly polished ferrotype plates.

If I have not already trespassed too long upon the time and patience of the meeting, I should like, in conclusion, to show a few slides illustrating what is meant by a good and bad negative, and showing some examples of easy and difficult objects.

Discussion.

The President said he had seen at the Royal Institution an exhibition of an apparatus similar to the one now described, but with one very charming addition. There was a tube at the side which reflected the image. The object was that for instantaneous work on any specimen of a moving description they could watch the instant with the bulb in their hand when the image was in the middle of the screen. No doubt Mr. Mummery had seen the apparatus.

Mr. Charters White said he should be very presumptuous indeed if he attempted to improve upon the paper Mr. Mummery had placed before them. It was so very lucid and full of truth that when published in the *Transactions* he would recommend every colleague of his to take it up and study it. He could endorse a great many of the statements from his own practical experience, with regard to the amount of light necessary to cut off with the iris diaphragm and on many other points. A great mistake was made in the practice of photo-micrography in having the details of the object so flooded with light that nothing could be seen but a glare. If the light was softened the details would gradually come out and they could get the photograph. He strongly agreed with Mr. Mummery as to the use of iso-chromatic plates and also as to the staining of the screen. A pale yellow screen—picric acid—was very useful to get contrasts. He had not been so successful with signal green, which appeared to lengthen the exposure without giving any very great benefit. The microscope supplied to him some years ago had a revolving diaphragm of several shades of blue, which he found very useful.

Beyond that he had seldom used more than the pale yellow or signal green. The scientific value of the coloured screen was yet in its infancy. Several gentlemen were working at it and were giving the results from time to time to the Royal Microscopical Society. No doubt they would in time find a screen that would answer their purpose in every way better than those they were now using. He was very pleased with the exhibition of Mr. Mummery's slides on the screen. He (Mr. White) had never worked anything up to a thousand diameters: it was beyond his power with Pickford's van and things of that kind rushing past his house over a granite crossing just in front of his door. The difficulties of photo-micrography were not overcome even by bundles of the *British Medical Journal* placed under each end of his stand. He envied those men who had a concrete floor and could live out in the country and do this sort of work. If they could only have an uninhabited island to themselves, photo-micrographers would be in a perfect paradise.

Dr. Pare asked Mr. Mummery how he used the screen, and also if he could say something as to the length of exposure of iso-chromatic plates. At present, being only an infant in arms in this subject, his great difficulty had been with the iso-chromatic plates and the yellow screen. He had used the yellow screen several times but as yet he had got nothing. He had got something now and again with other plates, but the colour did not come out quite right.

Mr. Roughton said, speaking from one's own experience, the practice of photo-micrography was rather an expensive matter. They might begin with a very simple apparatus consisting of a box, into which they poked the end of the microscope, thinking they were going to do wonders. Gradually they found that would not do, they must get something better. They accordingly made another apparatus, perhaps buying another microscope. Then they thought ordinary lenses would not do and apochromatic lenses were suggested. By that time there was not much left of £100. He advised any gentlemen going into photo-micrography to make up their minds at first to do it

properly, and to see if they could afford to expend a great deal of money on it, for if not they had better leave it alone. For his part he thought the value of apochromatic lenses was slightly over-estimated. He had taken a good many photographs of a certain object with an achromatic twelfth, and also with an apochromatic twelfth, and the difference between the two was not very great. He thought most of the work could be done as well with an ordinary achromatic lens as with the very much more expensive apochromatic lens. With regard to illumination, he always used the lime light, the exposure required being much shorter than with the oil lamp. It was very much more easy to manage in every way. The only difficulty was, of course, a little extra apparatus with the lime light. In photographing objects such as bacteria, at all events with the red or violet screen, he invariably used the Zettnow solution. What was wanted was that the image on the screen at the end of the camera should be practically black, and by the time the rays of light had passed through the Zettnow solution and reached the sensitive plate there were not many of them left. He wished to endorse the remarks made by Mr. Charters White as to cutting down the light with the condenser. The more faintly stained the object, and *a fortiori* if they came to unstained objects, the less illumination was required. The condenser wanted to be cut down so that they could only just see the image on the screen. By cutting it down very much and giving longer exposure, much better results were obtained than by shorter exposure with a bright light.

Mr. W. Hern asked whether Mr. Mummery had been able to get coloured photo-micrographs. At the Harveian Society last year he had seen some very lovely specimens of coloured photographs, fruits and flowers appearing perfectly natural. It struck him whether using similar methods for photo-micrography the actual staining could be brought out.

Mr. Beadnell Gill wished to thank Mr. Mummery for his valuable paper and also to endorse his remarks with regard to development. He did not think they quite un-

derstood the very great improvements that might be made by a more careful study of development. He would ask whether Mr. Mummery had found any particular advantage in his work from first immersing the plate a reasonable time in pyro before using the accelerator or the developer. From his own small experience he found that in many cases he had a great deal more control over the development by first getting the plate fairly well saturated with pyro. The photographs shown were particularly free from all appearance of air bubbles, and it would be interesting to know how the development was conducted.

Dr. Grevers asked whether Mr. Mummery had tried oiled ground glass as a screen. He (Dr. Grevers) was only a tyro in this business, but he thought it had been of some help, by enabling him to bring out the image very clearly on the ground glass instead of using the cardboard.

Mr. Mummery, in reply to the President, said he had heard from Mr. Pringle that he had just completed an instantaneous apparatus, and no doubt it would be very useful. It was, of course, useless for high powers, but for low power work and moving organisms it would be very valuable. With reference to closing the aperture of the iris diaphragm, he thought Mr. Charters White had somewhat misunderstood him. He was rather an advocate for a very full aperture; at all events with deeply stained or at all well stained preparations he got much better results with the full aperture than with the diaphragm much closed. If the preparation was unstained the aperture was closed to some extent, but not more than one could possibly help. He often closed it for focussing, opening it before taking the photograph. No doubt the signal green required a prolonged exposure, but when the exposure was sufficient the result was good. No doubt in taking these photographs everyone had suffered much from vibration, but a very good plan is to stand ready with a card nd if a cart is heard coming in the distance, just to put the card in and it could be taken out without the least vibration to the apparatus. Mr. Roughton spoke of the expense to which one was put in taking up photo-micrography. No doubt that was

a general experience. Improvements kept on being made, but still, one stopped short after a certain time. There was a beautiful apparatus devised by Mr. Pringle, and used at the Veterinary College, which was most elaborate. The operator could sit down at one end and move the whole adjustments. It had supports and pillars to prevent vibration, but he did not know but what quite as good work could be done without all this expensive apparatus, providing one had a firm table and a cement floor. Mr. Roughton also spoke of the use of the apochromatic lens. He (Mr. Mummery) agreed that as good results could generally be got with the ordinary achromatic lens as with the apochromatic; but the test came with difficult objects when they wanted to get plenty of light, and then the apochromatic lens was the best. He often, himself, used the lime light, but had, on this occasion, exhibited lamp light as being the most simple. Very good results could be got with the lamp. All Dr. Neuhauss' fine specimens of flagellated organisms were taken by the lamp, and nothing better was produced by the lime light. It was not his practice to have a very much closed condenser. In reply to Mr. Beadnell Gill, he did not think much was gained in developing by immersing the plate in the pyro first. He was very careful in adding the accelerator, putting very little at first, and then, as the image gradually came out, adding more. By that means he could get as good a result as by putting it first in the pyro and afterwards in the accelerator. He had never used the ground glass screen. He had used a porcelain screen instead of paper, but it was not so good. There was a certain amount of translucence in the porcelain, and cardboard gave better results. It was only for rough focussing, because directly the fine adjustment is commenced the paper screen is removed.

The PRESIDENT formally thanked Mr. Mummery for his paper and Dr. Grevers and Mr. Harding for their communications.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

March 4, 1895.

Mr. R. H. WOODHOUSE, M.R.C.S., L.D.S.

Vice-President, in the Chair.

The Minutes of the previous meeting were read and confirmed.

The following gentlemen were balloted for and elected resident members of the Society :—A. E. Baker, L.R.C.P. Lond., M.R.C.S.Eng., L.D.S.Eng., 22, Grosvenor Street, W.; Percy Francklin Henry, L.D.S.Eng., 79, King William Street, E.C.

The following gentleman was balloted for and elected a non-resident member of the Society :—Ridley Herschell, L.D.S.Eng., 6, Seaside Road, Eastbourne.

The following gentlemen were nominated for membership of the Society :—Leslie Maury Stocken, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S., Winchester House, Ealing (resident); Francis R. Flintan, L.D.S.Eng., Tower Lodge, Weybridge, Surrey (non-resident).

The Chairman said two gentlemen, non-resident members, had signed the necessary obligation forms, viz., Mr. William Simms, of Manchester, and Mr. Thomas Llewellyn Nash, of Inverness.

The Librarian reported the reception of the usual transactions and periodicals, and also the receipt from Dr. Grevers, of Amsterdam, of two bound volumes of Transactions for 1878-79, and 1879-80.

The Chairman said the Secretary had received a letter from the Laryngological Society of London, dated February 18, inviting the members of the Odontological Society to be present at, and participate in a discussion on the "Diagnosis and Treatment of Empyema of the Antrum," on March 13. Owing to the illness of the reader, the paper announced for that evening had been postponed. In the absence of the paper a good many Casual Communications had been promised, by means of which they hoped to have a pleasant evening.

Casual Communications.

Mr. Rose said, as some sort of apology for introducing so elementary a subject to the notice of the Society, it was not his intention to describe the ordinary daily routine of taking impressions of the mouth either in gutta-percha, wax, plaster of Paris, or composition, but he would try and illustrate one or two methods of taking impressions of mouths in which the teeth were so situated as to render it difficult, if not almost impossible, to take an impression in the ordinary manner. The success of the first operation depended upon the shape of the impression tray. It need scarcely be mentioned that the impression tray should approximate in size and shape to the model for which it was intended. It should be slightly larger, but still following the same outlines, so as to admit a sufficiency, but not an overplus of the modelling composition. By reducing the amount of composition to the smallest possible quantity the patient was able to tolerate the tray more readily, ensuring a more perfect and reliable impression. A common error in taking impressions of the mouth was the idea that it was necessary to take the impression on both the labial as well as the lingual aspects of the teeth. Taking a typical case, where eight front teeth were standing, and

from the recession of the gum, or other causes, were long and straggling, the teeth would be seen to present a series of cones, the broad ends represented by the points of the teeth. When the impression tray was inserted in the mouth, and the material flowed in between and around these teeth and was allowed to harden, one of two results must take place—either the teeth would be drawn up in the mouth, or the composition would be pulled out of shape. Fortunately, the latter was usually the case. If, instead of using an ordinary impression tray, they employed one with the front portion of the tray cut away, it would be seen at once that such a tray could be more readily removed from the mouth than one which took the labial aspects of the teeth as well; and at the same time it would allow of the composition being kept in the mouth until all danger of dragging had ceased to exist. Formerly, one of their greatest troubles was the length of time the composition took to harden. This could now be overcome by using what was known as the irrigated tray, *i.e.*, a tray so constructed that a volume of cold water was made to circulate through it. The effect of this on the composition was to the uninitiated perfectly astonishing. The moment the cold water circulated through the tray the tray itself became stone cold, and the composition was hardened in one or one and a quarter minutes. He had not the pleasure of knowing who was responsible for the invention of the irrigated tray, but his knowledge of it was derived from Mr. W. R. Humby, who had used it in practice for a number of years. With the ordinary irrigated tray for taking the front part of the piece as well as the back, the tray became so securely fixed in the mouth that it was sometimes impossible to remove it unless great force was employed, or the composition re-softened. With a tray such as he had described, with the front portion cut away, no such danger existed; a most beautiful and accurate impression of the mouth could be taken and at the same time one that could be easily removed. The next class of cases was that where undercuts were presented, and it was necessary to take them in sections. A typical case was that of a mouth

in which the second bicuspids and the first molars on either side had been removed; the second molar would perhaps have a tendency to lean forwards, and the first bicuspids the same tendency to lean backwards, giving a considerable undercut space. In taking an impression of a model such as that it was as well, after lubricating the fingers with a little vaseline, to take a little soft composition and mould it into the spaces represented by the loss on either side. These pieces could, if necessary, be removed from the mouth and trimmed up so that sharp edges were presented instead of their being round. When the pieces were re-inserted in the mouth the impression could be taken in the ordinary way; the pieces were left in position in the mouth and could be re-inserted into the impression tray after its removal. Where there was an extreme undercut it could be taken in two pieces, using pieces of German silver roughly bent up into shape so as to support the composition in the mouth. In the first place the impression of the lingual aspect and half the cavity was taken by one portion, a piece of plate supporting it in position. A guide was made in the centre of the piece of composition, and another piece of plate was taken, forming a little tray upon which some composition was moulded. That was then taken, and after the first piece had been removed and just a little vaseline rubbed upon it a second piece was pressed on the first. If it were found there were not sufficient guide to hold the two pieces firmly together, another small piece of composition could be placed over the two pieces, forming a little lock, and fastening them. This method answered admirably for cases where from absorption of the gum in front of the mouth it was necessary to take an accurate representation of the gum where no extensive recession had taken place. A small piece of German silver was bent to shape, a little composition moulded on it and pressed into the plate. It could be moulded accurately into position and smoothed up so as to bevel it upwards towards the point. This method depended for its success first of all on using an impression compound perfectly free from elasticity; secondly, on lubricating the fingers with vaseline

while rubbing it; and thirdly, on employing the smallest amount of composition and supporting the composition properly during the process of hardening. He had said nothing new, and his only excuse was that he considered taking impressions of the mouth one of the most important operations in dental procedure.

The CHAIRMAN said there was no need of apology on Mr. Rose's part for bringing forward this important subject, as it was one which appealed to them perhaps more than any other in their daily work. Without a good model they could not have good work. Mr. Rose had shown a good deal of skill and mechanical ingenuity in devising the means he had adopted, and it would be interesting to hear the experience of other members in the same line of work.

Mr. COFFIN said it would be of interest if Mr. Rose could state his views as to the desirability of making special cups and trays for cases as they presented themselves. They had often to ask themselves whether rough impressions should always be taken from which special trays should be made, or whether they should be satisfied with having a large range of ordinary cups which could be adapted to special cases. There was always a difficulty in one's mind as to which course should be pursued. It would also be useful if Mr. Rose could state whether he had any useful and simple method of making special cups to meet emergencies.

Mr. W. R. HUMBY said having used the irrigation tray for many years he felt some kind of diffidence in speaking on the matter, because it seemed to be a thing that had been invented by he did not know how many hundred dentists at different times during a period extending over ten years. Without receiving any previous information from anyone he had himself used it independently, and introduced it to his classes, and it was not until that had been done that he heard it had been introduced in other ways. With regard to the tray, it went into the mouth without any extra resistance, and certainly the wax maintained its shape during dislodgment. It was necessary

to be careful not to take club shaped teeth with it, or it would set so hard that it could not be removed. During the time he had used the tray, taking about 90 per cent. of his cases in that manner, only on two occasions had the tray become firmly fixed, and both then were easily removed by substituting warm for cold water in the circulating arrangement. He had adopted the plan of putting a little lubricant over any teeth which presented unusual difficulties, and found that a little ordinary soap was even preferable to vaseline. There were many soaps which were absolutely tasteless, and a little could be applied with the finger slightly moistened over the point of the tooth. It facilitated removal ; the material seemed to have intimate contact with the tooth and easy liberation was ensured. It was necessary to have rather a large range of trays, and they were rather expensive to make, but the results must be admitted to be superior to those obtained by any other method. He had perhaps seventy or eighty trays, and when from time to time they got a specially good shape not previously in stock, two or three trays were made. He should be very happy to furnish a description to any member of the process of making trays, so that members might be able to start really where he was leaving off, and perhaps improve on his methods.

Mr. W. Hern said in cases where teeth were long and straggling, with large triangular cone-shaped spaces between them, in using a special tray having no front surface the composition was liable to drive in between the spaces. In such a case, he was in the habit of filling the spaces with a little pellet of cotton wool or amadou or anything which would prevent the gutta-percha from running in between the teeth. The difficulty of the undercut he had nearly always got over by taking a piece of Gilbert's gutta-percha, which seemed to take the space very accurately, and was not difficult to remove.

Mr. Cunningham said the communication and the discussion seemed to have gone upon the idea that modelling composition was the only material to be used in taking an impression. He (Mr. Cunningham) would be willing to

submit a comparative model by the method to which he would refer, and which he also owed to another member of the Society. Mr. Rose had laid down as a kind of axiom, that if it were desired to take a good impression, the closer the impression tray corresponded to the particular case, the more likely were they to get a good result. In the method he (Mr. Cunningham) adopted he took first of all a rough model, had a special tray made to that, and then used gutta-percha for taking the impression. With regard to undercuts, he would ask, supposing they took a great deal of trouble to get the undercuts, taking a model as it were in two parts, as he had done several times, getting a very perfect model with the base of the triangle at the margin of the gum, and making the plate to fit that; what were they going to do then? In all these questions of taking impressions the personal equation was no doubt very important, but it was rather strange that no one had risen to speak on the question of a plaster impression. He did not forget their obligation to Mr. Coffin for having introduced gutta-percha material, first of all making a rough impression and making a final impression for the special case afterwards, and furthering also the proper use of gutta-percha. Whenever he had an edentulous case his habit was to take some renovating compound and use that when using modelling composition. Like other members he had been very much interested in Mr. Rose's communication, and none the less so because his practice differed so much from that of Mr. Rose.

Mr. W. A. Maggs said when he was secretary of the Society, some three or four years ago, he brought forward on behalf of Mr. Farnsworth, of Manchester, an irrigation tray. He did not know whether Mr. Farnsworth originated it, but as far as he knew that was the first time that the irrigation tray was brought forward at that Society.

Mr. W. R. Humby said he had been using them for several years when that was introduced. The Dental Manufacturing Company had made trays for the last ten or twelve years. Practitioners in different parts of the country had originated the same idea, and although there

was originality in each case it could scarcely be said where the priority lay.

Mr. Reinhardt said his trouble had always been in taking impressions, especially the lower, where all the teeth were standing and where both inside and outside impressions were taken, resulting in a tremendous drag. The composition ran in so far between the teeth that when it got very hard he had great difficulty in getting it out. He had never used the irrigated trays, but he had used a saliva ejector and the ordinary bulb syringe with cold water. He would like to know what method Mr. Rose employed when the impressions became so very hard.

Mr. Baldwin said the reason that many members had not risen was not because they did not use plaster but because they were glad to hear of other processes which seemed to offer good results. Personally, he used more plaster than any other material for taking impressions, almost always so in cases where the teeth seemed as if they would adhere to the impression material so that the impression would not be easily withdrawn. Plaster had the disadvantage that it was often very difficult to put together and took a good deal of time. It would not do to let the impression drag at all, or if it were allowed to drag it must be after it had got almost hard, otherwise the drag would extend for some distance round the tooth, and when the plate was made, although it would easily slip into the mouth, it would be found that it did not come close up to the teeth, but there was a space into which a thick piece of card could often be pushed. That was especially lamentable when there were bands right round the teeth, and where the band being made of vulcanite, on the inside of the molars for instance, could not be bent into close apposition. Personally he always had a special tray made for each case. It was made to a rough model and cast in tin without a handle, the handle being soldered on after the casting of the body of the tray. This was very easily done, the whole casting process not occupying more than ten minutes, and having the tray cast in tin instead of britannia metal the solder melted at a lower point than the

tin of the tray. With regard to priority of invention, he had seen an irrigation tray eleven years ago. He would like to ask whether the process of swabbing an ordinary tray with cold water and using a saliva ejector would not answer the same purpose as the irrigation tray.

Mr. Badcock thought that with gutta-percha and plaster anything could be done that was required. A special tray was of very great advantage, and he had found gilding metal a very useful material for making them in ; for this hint he was indebted to Mr. Morton Smale. It was a softish metal, easily struck ; and having struck the tray, on putting it into nitric acid for a few seconds it became clean and of the colour of gold. It was neat and clean in appearance, and did not involve any labour in polishing. Gutta-percha had the advantage of not only taking undercuts with extreme faithfulness, but of remaining soft to the end. It was not wanted to get hard in the mouth, and there was the great advantage in the case of loose teeth that a perfect undercut could be got, and there was no drag on the teeth. He had practically abandoned the use of composition in favour of gutta-percha and plaster. He used plaster almost exclusively in plain cases with no teeth or one or two teeth standing. Where an undercut was required he could always depend upon gutta-percha, and the result was very good. The only objection to it was that it had to be kept in the mouth for some time longer than when composition was used.

The Chairman asked Mr. Badcock if the temperature of the gutta-percha was not sometimes an objection.

Mr. Badcock said that although water had to be used very hot for melting gutta-percha, nevertheless, owing to some peculiar quality it did not burn the patient anything like so often as composition. One reason was that after putting the hot gutta-percha into the tray, the whole thing was dipped into cold water before inserting in the patient's mouth, and he found that complaints as to temperature were rare.

Mr. Storer Bennett said they were indebted to Mr. Rose for an extremely interesting discussion, more especially

as it had brought out some two or three opinions on the subject that he had introduced. He was quite sure that Mr. Rose did not claim any originality for his method of taking models, and it would be within the recollection of the members that some four or five years ago Mr. Andrew brought forward a method, practically the same as the present one, taking undercuts by means of cores, and long before that time the method was one known and practised by a great many members of the Society. Like Mr. Cunningham, he felt inclined to challenge Mr. Rose's statement that the only method of taking these undercuts was the one that he had suggested. Undoubtedly, gutta-percha could be used for some purposes, but his own pet method of doing it was by using plaster of Paris. He had never seen any undercuts that could not be taken by that means. It had this advantage, that by carefully watching the time of setting of the plaster of Paris, the mould could be removed piece by piece, securing an impression of the loosest teeth. Whilst agreeing with Mr. Cunningham as to the merits of different kinds of composition, he could not help challenging the statement that when this admirable impression of the undercut had been obtained it was of no value. He was sure they could not have too perfect a model. They could always fill up anything if necessary, but if they had not got it to start with they were working at a disadvantage. He believed that every undercut could be, as a rule, utilised, and a little method that he brought before the Society, two or three years ago, of inserting plates, not by pushing them down between the teeth, but inserting the plate from the lingual side, and pushing it out towards the buccal, utilised the undercuts to a very large extent, enabling them to be of great advantage, because by the fact of the cavity being V-shaped with the base towards the gum the plate was held in position and could not possibly rise. He therefore believed that the greatest advantage was derived from having the most perfect work, and could not agree that the undercut when it had been got was of no use.

Mr. Robbins said he had been waiting to hear if one

other plan would be mentioned, namely, that of combining two very opposite materials for taking impressions, plaster and composition, in one and the same impression. In many cases of undercut the difficulty could be got rid of by this method. Plaster could be built around a tooth with very much undercut; it would set quickly and then one could take a composition impression on that, and when it was removed from the mouth, by easing away the undercut plaster core and putting it in place, a fairly good model could be got with less difficulty than by a plaster impression. With reference to special trays, although generally used, he did not think they were a necessity. With a decent assortment of trays one could, with a little manipulation, get a fairly good adaptation, at any rate for the first model. He did not even think it necessary to have a tray for the long incisors standing in the lower jaw with the front of the tray cut out. The way to get out of that he had always found was by not putting composition where it was not wanted, but by roughly moulding the composition with the thumb and finger, allowing for the teeth that were standing. In that way they did not invite a failure, and for men in busy practice and working sometimes at great pressure, it was an advantage not to have to make a special tray. There were, however, cases where success could only be got by special trays. With reference to the undercut, he tried plaster of Paris cores some time ago. He had two cases presenting themselves one after the other in the mouths of brothers. In each case the roof was so vaulted and sharp that it seemed like the keel of a boat. He got over the difficulty (having failed with a plaster impression) by simply mixing up some plaster of Paris, building it into the palate, getting it almost to the level of the cervical aspect of the molars and then taking his composition over that, and a fairly good result followed. He was very glad that Mr. Hern had mentioned a very important point, namely, that of plaster between front teeth, for however nicely they might make the model, there was always a danger of dragging. Then, again, he would suggest that material should not be

put where it was not wanted, but by packing either with cotton wool or amadou, a fair representation could be got without the inconvenience of dragging afterwards. With reference to the irrigation tray, although after Mr. Humby's demonstration some time ago, he had felt inclined to try it, the difficulty was that it must take a long time to make those trays, and when the composition was well placed, just flashed over the spirit lamp, and a little cold water drained upon the back of the tray, they could, as a rule, get a very good result without the irrigation tray.

Mr. Rose, in reply to Mr. Coffin, said that for any case presenting any difficulty he usually made a special tray. Making a special tray did not entail the least amount of discomfort to the patient. As a rule, he used bees-wax to take a temporary impression of the mouth, and to that impression made the special tray. He quite agreed with Mr. Hern that in packing spaces in front of the teeth anything which would exclude the composition from going into spaces, or round teeth, or into a cavity where it was not required, was a very great advantage. In reply to Mr. Cunningham, he called attention to the fact that he was discussing purely and simply the merits of taking these impressions in composition. He was not referring to the use of gutta-percha, plaster of Paris, or any other material, not wishing to draw any comparisons. He used composition because it took the least possible amount of time to mould into shape, and by its use he could produce undercuts or duplicate his impression so quickly that two or three could be taken as against one in plaster. He was quite aware that Mr. Coffin had a special liking for gutta-percha and an admirable way of working it. With regard to the spaces between the teeth, it was most important to get the gum perfect and free from distortion. It was very easy to make allowance for an undercut so as to adjust the band, but when the plate rests on the gum it should rest on something that it did not injure, and the patient should be able to masticate fairly with it. With regard to softening the composition, he had only that afternoon tried the experiment of passing a stream of warm water through an irrigated

plate perfectly cold and full of composition, and he found that in less than five minutes the composition could be re-softened so that it might be taken out of the mouth. In practice the composition when pressed into the mouth did not come through from the back of the teeth sufficiently far to make an undercut at the front. Mr. Baldwin had suggested that the same result could be obtained by swabbing the impression tray with cold water, using an ejector for the purpose. There was nothing to prevent that being done, but it was not as nice a method of obtaining the result as with the irrigated tray. With regard to what Mr. Badcock had said of gutta-percha he, Mr. Rose, used composition purely for the reason that it took considerably less time to harden, and gave better results. The same would apply to plaster of Paris. In order to obtain good results it must remain in the mouth nearly five minutes, and if impressions were to be taken in sections, it must be remembered that there was always a slight expansion of the plaster. He could fully bear out Mr. Robbins in his remarks as to ordinary trays. For mouths presenting no difficulties ordinary trays could be used as successfully as special trays. Mr. Cunningham had made him say that he used a tray that should accurately, or nearly accurately, fit the mouth. He did not say that at all; what he said was that it should be large enough to admit of a sufficient amount of composition, but not an overflow.

Mr. Hopson brought forward a case of a lower canine erupting through the lip which had been brought to his notice at Guy's Hospital. Fortunately a fairly accurate account was obtainable from the surgical register of the previous history. The patient was a girl aged $2\frac{1}{2}$, who was admitted into Dorcas Ward on January 19, 1878, for *cancrum oris*. Twelve days before admission the patient had developed an attack of measles. A week later her mother noticed a black spot inside the left angle of the mouth. This was thought to be an abscess and a poultice was applied. But as the sore rapidly spread the child was

brought to the hospital. On admission the cheek was eaten away by phagedænic ulceration, the part affected extending from the left corner of the mouth outwards and downwards, describing an arch about the size of a five-shilling piece. The free borders of the upper and lower lips were included, especially the lower lip. The alveolar border was laid bare and there was a very fœtid smell. Mr. Howse saw the patient and freely applied nitric acid to all the affected tissues. After the sloughs caused by the nitric acid separated, a small portion of phagedænic tissue was seen to be still there, so nitric acid and nitrate of silver were again applied. After this the child seemed so much better that she went out on February 1 with the wound granulating up well. She came again into the hospital four months later with some more ulceration in the old place. This was again treated with nitric acid and nitrate of silver, and some loose teeth extracted. After this a few pieces of necrosed alveolar process came away, but the wound granulated up well, and the patient went out on June 14 with the place practically healed. Subsequently the tissues of the cheek and lips became firmly adherent to the maxilla, greatly limiting the movements of the jaw in mastication. When she was thirteen years of age she erupted a left lower canine, which pierced the lip (which in that condition was adherent to the alveolar process), and this causing great disfigurement, having apparently tolerated this condition for six years, she came up to the hospital last January and the tooth was removed. She could separate her teeth only to the extent of about a quarter of an inch, but still was able to speak and masticate her food fairly well. Models and photographs of the case were presented.

Mr. A. R. Colyer brought forward a case of incomplete eruption of the first permanent upper molar. It occurred in a patient aged 30. She complained that for three weeks there had been a great deal of swelling on the side of the face, of a painful character. On examination, the left first

permanent molar was found impacted, the grinding surface of the crown being on a level with the necks of the other teeth, and slightly tilted forwards, the whole of the crown, with the exception of the grinding surface, being covered with gum. A putrid discharge round the tooth had been noticed for nine months. The other teeth were normal in every respect. On passing the probe round the tooth it went up a considerable distance, and then came to a very hard margin. The tooth was extracted and the pulp found normal, the abrupt margin felt by the probe being the lower limit of a considerable mass of thickened cementum. Two days subsequently a second temporary left molar was removed from the socket. The patient two weeks afterwards went to America, and on returning home a year later a small piece of necrosed bone was removed.

Mr. Storer Bennett asked for some further information as to where the second tooth was found in relationship to the first one removed.

Mr. A. R. Colyer said he could not find any relationship at all. He removed the first permanent molar one day and found the temporary molar loose in the socket on the second day. He thought it was a case of unerupted temporary molar preventing the full eruption of the six-year-old molar. He believed the temporary molar was placed between the anterior buccal root and the palatine root of the permanent molar.

Mr. Ackery said a similar case was presented to the Society two years ago, of an impacted first permanent molar in the lower jaw. At that time he was rather in hopes that some explanation might be offered as to how these first permanent molars could be impacted. In the case referred to, the bicuspids were present and the second molars in position. It occurred in a lad about 12 years old, and he was quite at a loss to explain why the first permanent molar should have been prevented from getting up to its normal length. He should be glad to hear of any suggestions as to the causes that might operate to prevent the full eruption of the first permanent molar.

Mr. Humby said it was rather rare to find a first per-

manent molar retarded in eruption, and still more so to find more than one tooth retarded. They sometimes found a permanent molar down on the level of the gum, as in Mr. Ackery's case, and also other temporary teeth not rising to their right level; but in the case mentioned by Mr. Colyer it seemed as if the permanent tooth had come into position and had been succeeded by a temporary tooth, that was to say, that the temporary tooth had attempted to erupt, and had erupted between the roots of the permanent tooth.

The CHAIRMAN said it sometimes happened that a tooth did get caught in that way. It seemed to be a case in which the temporary molar was caught in between the first permanent molar and the second bicuspid, and was held back in some way in the socket until the permanent tooth was removed.

Mr. HUMBY said, with reference to depressed molars, it was sometimes very difficult to decide whether a tooth, such as the first permanent molar, really had ever been of full length and afterwards receded into the socket, or whether the tooth had risen up to a certain distance and then refused to rise any higher. He had a very curious case, where great pain was referred to a depressed lower molar of that kind; the tooth was subsequently extracted, but although it had been the seat of very great pain it was apparently perfectly free from caries. It was a case on all fours with that mentioned by Mr. Colyer, excepting that there was no temporary tooth.

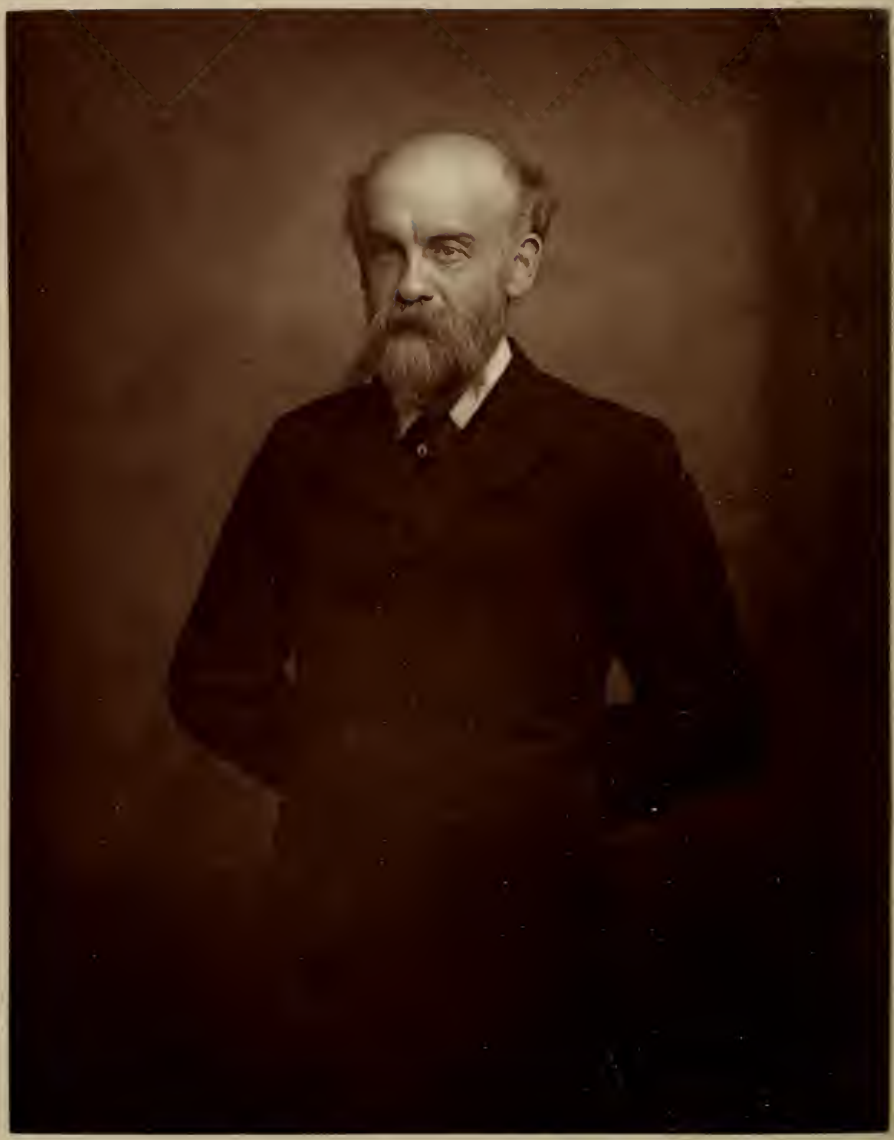
Mr. MAGGS said it appeared to him as if the position of the temporary tooth was where Mr. Colyer had stated, namely, between the anterior buccal and palatine roots. Was the crown at the level of the gum margin or somewhere between that and the occluding surface of the permanent molar?

Mr. A. R. COLYER said the grinding surface of the molar was on the level of the necks of the other teeth, being slightly tilted forward.

Mr. Storer Bennett said he wished to draw attention to a case of prolonged and intense pain after the extraction of a tooth due to an irritated nerve being exposed at the apex of the socket, which resisted all treatment until it was incised. On November 15 last he was consulted by a lady, aged 23, who was suffering from serious periostitis in her left upper wisdom tooth, the only remaining molar on that side of the jaw. A few days previously she had undergone an operation on the right side of her mouth, which was immediately followed by pain in the left upper wisdom tooth, with inability to insert a plate which she had worn up to that time. The operation had been performed under an anæsthetic, and the mouth kept open by a Wood's gag inserted on the left side, but which had been so unfortunately used as to dislocate the wisdom tooth on which it rested. He (Mr. Bennett) wished to venture on a word of warning in the use of this powerful instrument, which he had known to occasion serious pain in many instances, with causing which the dentist had been credited rather than the anæsthetist, who had been the real offender. Feeling that it was hopeless to restore the dislocated tooth to its former position, he decided to extract it, and the tooth was removed without difficulty. The socket, however, was intensely painful, and remained so during the next twelve days, during which repeated applications of strong carbolic acid, tincture of aconite, and strong solutions of cocaine were applied to it without relief, and hot poppy fomentations held in the mouth were equally useless. In the meanwhile the socket granulated healthily, except at its apex, where he detected, by the aid of a mirror and probe, a spot about the size of a pin's head, which looked white in colour, in marked contrast to the red of its surroundings, and caused the greatest agony on being touched, no matter how lightly. Bearing in mind that John Hilton in his lectures at the Royal College of Surgeons in 1860 described "some instances of ulcers and wounds which were very painful in consequence of the exposure of the ends of nerves in the wounds, cases in which the pain was stopped by the division of the nerve just below the surface of the wound," it occurred to him that this was

a case of a similar nature, and that would yield to similar treatment. He therefore passed the blade of a Paget's knife into the socket for about a quarter of an inch and cut across the nerve with the happiest result, for the pain instantly ceased, never to return.

The thanks of the Society having been given to the authors of Casual Communications, the meeting adjourned.



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S. J. HUTCHINSON, M.R.C.S., L.D.S., Eng.

President, 1891.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

April 1, 1895.

Mr. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

President, in the Chair.

The Minutes of the last meeting were read and confirmed.

Mr. F. E. Davar, L.D.S.I., Church Gate Street, Fort, Bombay, having signed the obligation book, was admitted a member.

The following were balloted for and elected resident members of the Society :—Francis Mark Farmer, L.D.S. Eng., 17, Great Marlborough Street, W.; Harry Symes Prideaux, L.D.S.Eng., 41, Wimpole Street, W.; Frederick James Frankland Rooke, L.D.S.Eng., 42, Kensington Gardens Square, W.

The following were balloted for and elected non-resident members of the Society :—J. Main Nicol, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng., 2, Clarendon Road, Leeds; George Arthur Peake, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng., Alma House, Cheltenham; Frank C. Porter, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng., 12, Oxford Street, Nottingham; George Nash Skipp, L.D.S.Eng., Sale, Cheshire.

The following were proposed for non-resident membership :—William Jarvie, M.D.S., 105, Clinton Street, Brooklyn, New York; John William Tomlinson, L.D.S., 8, Warrior Square, St. Leonards-on-Sea.

The Librarian reported that Mr. R. H. Woodhouse, a Vice-President, had presented to the Society seventeen bound volumes of the *Medical Society's Transactions* from the year 1872 to 1894, and that he had received the *Manufacturing Chemist*, and the *Smithsonian Report* for 1893.

The Curator said he would like to make a request of members of the Society that had been made before, viz., that if any gentlemen possessed old specimens of mechanical dentistry the Society would very gladly receive them, more especially cases of bone work, and particularly those having natural teeth inserted. These things were becoming year by year more scarce. Probably the majority of them got thrust on one side, whereas in a Museum like theirs, where a number of them could be viewed together, they were very valuable, and could be as useful and more so than in private collections. Some years ago a member of the Society did present a large number. No doubt many members had plates of the description referred to and they would be a great acquisition to the Museum.

Mr. Brunton showed a modification introduced in a Hodge right-angle handpiece, by simply shortening the portion which carried the bur to enable the operator to get at the more awkward places in the mouth. It was specially useful in children's mouths. The nut at the back was shortened, and there was a key provided for tightening it up, but in practice the key was not absolutely necessary. (The modification is supplied by the Dental Manufacturing Company.) He also showed a simple balance for weighing amalgam, and a rack arranged for holding mallet plugger points, so that with one hand the points could be changed.

Studies in Superior Protrusion.

By George G. Campion, L.D.S.Eng.

In opening a discussion on protrusion before this Society in March, 1892, Mr. Hepburn described with some minuteness, and I believe, for the first time, a distinct variety of this deformity; a variety which cannot be attributed "to mechanical influences, such as thumb-sucking, or the impingement of antagonising teeth," and where "the cutting edges of the lower incisors exist, as it were, in space, pointing upwards towards the palatal vault, and free from contact with any of the super-existing structures." He also spoke of this distinctive protrusion as being associated with an increase of bone in the premaxillary region, and elsewhere has expressed the opinion that it may, at any rate in some cases, be caused by a continued growth of the premaxillary bone as distinct from the maxilla. Now in these cases Mr. Hepburn described the upper canines as being erupted in a large number of typical cases in normal antagonism with their opponents, but,

judging from the examination of a considerable number of specimens, I am inclined to think that these teeth, although often in antagonism with their opponents, are not in "normal" antagonism.

Figure 1 shows the general appearance presented in this form of protrusion, the uniform extension of the upper arch, the wide space between the lower incisors and the upper gum, the upper canines almost, but in this case not quite in contact with their opponents, but biting, however, not as they should behind, but in front, of them; and this abnormal bite extends to the bicuspid and molar region as well, the upper bicuspids articulating in front instead of behind their opponents, and the upper molars being to the same extent in advance of the lowers. There is, of course, nothing original in this observation. Kingsley, in his work on oral deformities, describes and figures such a case, and shows the results obtained in treatment by jumping the bite. There are also one or two other similar cases on record which have been successfully treated in the same way, but these have, I fancy, been regarded by practitioners generally as rather in the nature of rarities, whereas I believe that an examination of a large collection of models of protrusion would show them to be in reality common. One of the two models which Mr. Hepburn figured in the Society's Transactions

showed this mal-occlusion in the masticating region, though Mr. Hepburn did not himself call special attention to it.

In examining during the last twelve or eighteen months such models of this deformity as I have happened to come across, and noticing such cases as from time to time presented themselves in patients, I obtained a list of thirty-nine cases of different kinds and degrees of protrusion, and in only four of these, or just over 10 per cent., was the molar occlusion normal on both sides of the mouth, while in twenty-four cases, or about 61 per cent., the lower teeth articulated the breadth of a bicuspid behind their normal position. In other cases the articulation varied on the right and left sides of the mouth, and in some the molars and bicuspids met cusp to cusp, or half the breadth of a bicuspid posterior to the normal bite. Tabulating the cases and briefly expressing these two positions as Back and Half Back, we have :—

LEFT.		RIGHT.		
N.	..	N.	..	4 Cases.
B.	..	B.	.	24 ,,
N.	..	H.B.	..	2 ,,
B.	..	H.B.	..	5 ,,
H.B.	..	B.	..	1 ,,
H.B.	..	H.B.	..	1 ,,
—	..	H.B.	..	1 ,,
H.B.	..	—	..	1 ,,

This list, however, probably exaggerates the number of those with Back occlusion on both sides, because in several of the models teeth had been lost, and the position of the others consequently deranged; and I have classed as Back some in which perhaps a lower second bicuspid has been removed, and the molar come forward into a more normal position if the first bicuspid and canine showed themselves distinctly behind instead of in front of their opponents. It would be necessary to obtain particulars of a large number of cases in which no teeth had been removed in order to estimate with any accuracy the proportion which show this mal-occlusion in the masticating region.

I was at the time a good deal surprised at this result; if not quite exact, the figures at any rate show that in a large proportion of cases we have to deal not merely with an abnormality of a few of the anterior teeth but with a deranged articulation of the entire arches; a derangement which, whatever its origin and causes, is established early in the life of the child, for it is to be seen not only in the permanent but also in the temporary teeth (fig. 2).

I found, too, that this mal-occlusion is by no means confined to cases of protrusion, but exists also in many cases of general crowding of the upper teeth, of overlapping centrals, instanding

or outstanding laterals, and projecting canines, and also that it is possible to find quite a number of cases in which children who are brought to us for consultation on account of general crowding of the upper teeth, present also the condition of protrusion of the upper arch in relation to the lower, though this is subordinate to, and masked by, the general irregularity. They in fact present us with transitional forms between the ordinary cases of protrusion on the one hand, and general crowding on the other. To this point I shall recur later.

It is not easy to see the exact significance of this derangement, or the way in which it is brought about. At first sight it seems as if it might be occasioned in one of three ways: either (1) a bodily protrusion of the maxilla, or (2) a want of development of the mandible, or (3) posterior displacement of the latter bone, if it be of normal size. Kingsley seems to hold that the last of these possible conditions is generally the explanation, as this explains both the ease with which in some cases he claims that the bite can be jumped, and also the receding chin which is so often associated with the protrusion. But this view is inadequate to explain the different conditions met with. It takes no account of the development of the mental prominence of the mandible which is shown by the photo (fig. 3) to be an all-important

factor in determining the projection of the chin, and it fails to account also for those cases where, with a chin of normal projection and a mandible of apparently normal size, we still get the back occlusion of the lower molars (figs. 4 and 5). My impression is that in some cases we have to do with a defective development of the mandible, and in others with a bodily protrusion of the maxilla, but the point is a very difficult one to settle. It cannot be decided by absolute measurements of the mandible, for at the age of 12 or 14 the angle of this bone is not sufficiently developed to afford any point definite enough to measure from, and in addition the determination of the average size of this bone at different ages, and in the different sexes, would present too many fallacies to make the method of any use where such comparatively small differences are of importance.

But it occurred to me that more definite results might be obtained by some proportional measurements made in a similar way to that adopted by anthropologists in determining the projection of the dental arch in relation to the rest of the face by means of the gnathic index.*

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* The gnathic or alveolar index is ascertained in the following way: The distance from the Basion (the centre of the anterior margin of the foramen magnum) to the

On twelve children of ages varying from 12 to 15 I tried computing this index by measurements taken from the auricula point (centre of external auditory meatus). The indices thus obtained varied from 94 to 104, the average being 99·4, while in three cases of protrusion the indices were 100, 101·8 and 103·6. But even if it could be shown that in a number of cases of protrusion the indices were considerably higher than in a similar number of normal cases, this fact would be of little value in attempting to determine whether the maxillæ in the cases of protrusion were abnormally projecting, because, as will be shown presently, the form of the entire arch is altered in such cases, and also the position of the alveolar point in relation to the rest of the maxilla.

Another feature worthy of notice in these cases, and which has never, so far as I am aware, been carefully studied, is the breadth of the dental arch and its relation to the length. In a paper read before the Society many years ago, on an attempted classification of irregularities of

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Alveolar Point (the point on the edge of the external plate of the alveolus between the upper central incisors) is multiplied by 100 and divided by the distance from the Basion to the Nasion (centre of naso-frontal suture), thus:

$$\frac{\text{Basialveolar length} \times 100}{\text{Basinasal length}} = \text{Gnathic Index.}$$

teeth, Mr. Oakley Coles, adapting two terms used by anthropologists in cranial measurements, proposed the words brachoid and dolichoid to denote respectively arches which were above the average measurements in breadth and length; but his application of these terms was based on no absolute measurements of the arch, nor as obtains in their use by anthropologists, on any relation between the measurements of length and breadth. So applied, their use was arbitrary and impossible of exact application, and made no allowance for necessary variations in the absolute size of arches which, *cæteris paribus*, will obviously depend on the absolute size of the teeth. The terms, however, seem convenient ones for adoption in any discriminating classification of the different forms of arches, if their application be based on relative measurements, for this would allow for any variation in the absolute size of the teeth; but the application of these terms could be only made after a careful and extended study and measurement of a large number of fairly normal arches. I have attempted to apply this method of relative measurement to the arches in cases of protrusion for comparison with normal dentures, and the result is striking and suggests some interesting conclusions.

Three years ago, in studying a series of models in the museum of the College of Surgeons, to

ascertain their bearing on the accepted views as to the development of the jaws, Mr. Tomes took the following as fixed points for measurement: for length, "the distance from the middle of the back edge of the grinding surface of the second temporary molar to the centre of the back of the neck of the central incisor of the same side, at the point where the gum joins it;" for width: "the distance between the middles of the grinding surfaces of the second temporary upper molars, and afterwards of the second upper bicuspids." Now these points, though doubtless best suited to the purpose Mr. Tomes then had in view, are not so suitable in studying protrusion. They would, for example, not record any protrusion resulting from the inclination forwards of the incisors. So I took instead—for length, the distance from the mesial extremity of the cutting edge of the central incisor to the centre of the posterior border of the masticating surface of the six-year-molar. The mean of the measurements on each side was taken as the length of the arch, there being often a slight discrepancy between the measurements of the two sides. For breadth I took the measurement across the arch between the most prominent points on the labial surfaces of the first bicuspids or first temporary molars. The first bicuspids were chosen for the point of

measurement of breadth, as being about midway between the extremities of length, and also because the breadth varies more in the bicuspid than in the molar region, and it was precisely this variation which I wished to study. And taking extreme points for length measurement, it seemed well to take them also in determining the breadth, and so the labial surfaces were fixed on instead of the centres of the masticating surfaces which were chosen by Mr. Tomes. The length and breadth being determined, their relation was calculated in the same way as the cephalic index.

$$\frac{\text{Breadth} \times 100}{\text{Length.}} = \text{Breadth index of the arch.}$$

Determining in this way the relative length and breadth of a certain number of fairly normal arches, I found the index to range approximately from 105 to 115. As compared with these I found in 28 cases, showing different degrees of protrusion, that the indices varied from 84 to 102. Four only had an index of 100 or over, *i.e.*, had almost normal arches, and all four presented the posterior occlusion of the lower molars. In three of them the protrusion was more than accounted for by this mal-occlusion, and in the fourth, by placing the models in their proper articulation, the protrusion was rendered comparatively slight—so slight as to be readily cured

by pressing the incisors back till the slight spaces between them should be obliterated; this case being one in which the protrusion caused by the posterior occlusion of the lower teeth had been exaggerated by thumb-sucking.

In the other cases the index averaged about 93 or 94, showing arches relatively narrow. This, of course, was to be expected. A moment's consideration will make it clear that an arch with protruded incisors, even if of normal width, in absolute measurement must appear narrow in relation to its length. But in these cases of protrusion we find an absolute as well as relative diminution of width. In twelve cases of normal arches the average width was 46·9 mm., and in twenty-six cases of protrusion only 41·3 mm., the average width of the normal arches thus exceeding that of the protruded arches by 5.6 mm.

Now this is very interesting and suggestive, although the number of normal arches measured is too small to eliminate the possible fallacy arising from the different sizes of teeth in the different arches. But it certainly suggests that there may be some causal relation between the narrowness of the protruded arches and their length. It is one thing, however, to show a relative or even absolute diminution of the width of protruded arches, and quite another to prove a causal nexus between the narrowness and the

Tabular Statement with Particulars of 28 Cases of Protrusion.

		Molar Occlusion.		Lower Incisor	Low. Inc. Raised or	Upper Arch.		
		Left.	Right.	Occlusion.	Normal.	Length.	Br'dth.	In
1	Miss A. P. Thumbsucker till two years before casts ..	N.	H.B.	Free	N.	45	43	9
2	Child aged 4. Thumbsucker	N.	N.	Free	—	—	—	—
3	Miss G.	N.	N.	Gum	R.	49	45	9
4	Thumbsucker	N.	N.	Free	—	—	—	—
5	E. (lad). Two protruding Centrals. Lo. Bics., and Rt. Can. and Lat. crowded ..	N.	N.	Free	N.	45	40·5	9
6	Miss. O. Slight P.; L.L. six M. lost with disarrangement	—	H.B.	Neck	R.	41	38	9
7	Miss D. Severe P., wide space, separation	B.	B.	Free	N.	42	42·5	10
8	L. H.	B.	H.B.	Gum	R.	46	42	9
9	Miss E. Centre to right R. Rt. Canine unerupted ..	B.	B.	Free	N.	(45	39	8
10	G. B. Long Centrals, Lip Biter	B.	B.	Free	N.	46	42	9
11	Miss W. Separation	B.	H.B.	Neck	R.	49	44	9
12	Miss T.	B.	H.B.	Neck	R.	45	42	9
13	Miss S. Severe Central P., Thumbsucker	B.	H.B.	Gum	R.	47	42	8
14	A. L. Receding Chin	N.	B.	Gum	R.	47	46	9
15	A. W. Double Protrusion ..	B.	B.	Gum	R.	49	44	9
16	L. C. Protrusion with overlapping Cents.	B.	B.	Free	Slight R.	45	41	9
17	M. M.	B.	B.	Free	N.	42	39	9
18	S.	B.	B.	Free	N.	42	43	10
19	S.	B.	B.	Neck	N.	42	41	9
20	Miss Z. Slightly protruded and crowded Incisors ..	H.B.	H.B.	Free	N.	45	42	9
21	Miss K. G. Severe protrusion Centrals	B.	B.	Gum	R.	44	37	8
22	Miss E. S.	—	B.	Gum	R.	38	35	9
23	—— Very small Teeth. Slight P. with Spacing	B.	B.	Free	N.	39	39	10
24	Miss D. M.	B.	B.	Neck	N.	45	40	8
25	Miss B. B. Hereditary ..	B.	B.	Gum	R.	44	41	9
26	D. B. R. Lo. Mol. lost early, derangement	H.B.	—	Gum	R.	50	(42)	8
27	H. O.	B.	B.	Free	N.	44	43	9
28	N. FF.	B.	B.	Free	N.	43	43	10

MEASUREMENTS OF DENTAL ARCHES, MOSTLY NORMAL.

		Upper.			Lower.		
		Length.	Br'dth.	Index.	Length.	Br'dth.	Index.
1	Skull, aged 8. Instanding Laterals	40	41	102	38	38	100
2	,, ...	41	47	114	37	40	108
3	,, Long Arch	47	46	98	42	41	98
4	,, ...	41	46	112	37	40	108
5	,, ...	45	51	113	—	—	—
6	,, ...	39	41	105	—	—	—
7	Model	45	47	104	—	—	—
8	,, Two supplemental Laterals in line	44	48	109	—	—	—
9	,, Very Broad Arch, two Supernum. in palate ..	41	51	124	—	—	—
10	,, ...	42	45	107	—	—	—
11	,, ...	46	53	115	—	—	—
12	,, ...	43	51	118	—	—	—
13	,, Narrow-pointed arch	43	39	90	—	—	—
14	,, ...	43	46	107	39	42	107
15	,, ...	39	43·5	112	—	—	—
16	,, ...	41·5	46·5	112	—	—	—

Omitting the abnormal arches 1, 8, 9, 13, the remaining twelve give the average width (46·9), mentioned in the paper.

protrusion. The argument looks seductive, but the facts might, without much difficulty, be stated so as to suggest precisely the opposite conclusion. An examination of these cases, it might be said, shows in many of them an abnormal development of bony tissue in the region of the upper incisors. This excessive formation of bone, due to an abnormal proliferation of bone cells, carries the teeth forward with it, and with the pressure which we know to be constantly exercised by the cheeks and lips on the exterior of the dental arch, what more natural than that as a result of its elongation its sides should

partially collapse? This seems to be partially, at any rate, the view of Dr. Talbot, but his phrase about "the abnormal proliferation of bone cells," has always struck me as a particularly unhappy one. It is one of those explanations which offer no explanation. It has much the appearance of one of those phrases contrived more as a means of concealing our ignorance than of stating our knowledge, and to be inadequately contrived even for that. It is a truism and at the same time a paradox, for it implicitly denies the accepted doctrine that the alveolus, which alone appears to be concerned in these cases, is built up in support of, and is dependent upon the position of the teeth. I am far from denying that there may be in a few cases some "inherent vice," to borrow Mr. Tomes' phrase, in the development of the bone itself at this point, but that this is so in the majority of cases needs certainly more proof than exists at present.

On the other hand that the narrowness of the arch has some causal relation to its protrusion is shown, I think, by those cases occasionally seen where on one side of a protruded arch one of the teeth has failed to erupt. Here we find that there is a *vis a tergo* on the opposite side, which has driven the centre to the side of the unerupted tooth, and has left one central (the one belonging to the side on which there is the full complement

FIG. 1.

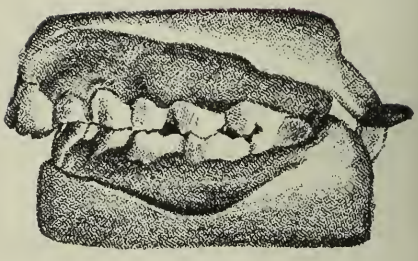

FIG. 2.
Models showing posterior occlusion of lower six-year molar and temporary molars.

FIG. 3.
Two mandibles showing extreme variations in the development of the mental prominence.

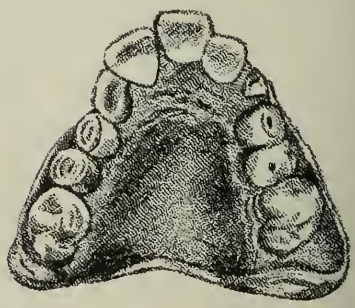

FIG. 6.
Upper model of a case of asymmetrical protrusion. The left canine is erupting: the right has been excluded from the arch and can be felt high up on the outer side of the alveolus.

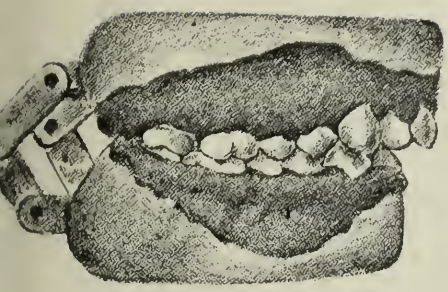

FIG. 4.
Profile and models from a lad aged 14 showing posterior occlusion of lower teeth associated with well formed mandible and chin.

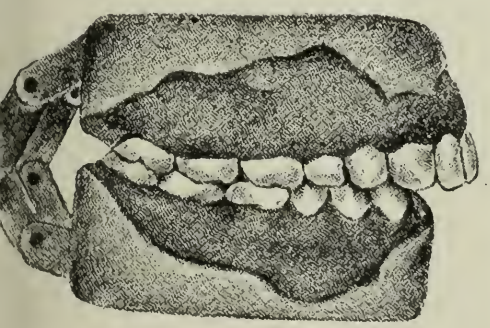

FIG. 5.
Profile and models from a man showing posterior occlusion of lower teeth associated with receding chin.

of teeth) more prominent than the other (fig. 6). It is fair to conclude that in these cases, had the missing tooth remained, and erupted in line, the protrusion would have been symmetrical and more pronounced than was actually the case. And further, in view of the cases mentioned above, in which slight protrusion is associated with general crowding, we are justified I think in concluding that the same cause, according to the position of the developing teeth in their alveoli, may eventuate either in protrusion, in general crowding or overlapping of the incisors, or in the exclusion of one or more of the teeth from the dental arch, and that we must cease to regard protrusion, in at any rate many cases, as essentially and peculiarly a deformity by itself.

Talbot claims to have shown by an enormous number of most painstaking and careful observations made by himself and others all over Europe and the United States, and extending over a period of no less than eight years, that the lateral diameter of the dental arches of certain peoples of the human race has diminished perceptibly within historic times. He says :—

"The early Briton possessed jaws which measured from 2·12 to 2·62 in their lateral diameters, while the jaws of the present English people measure from 1·88 to 2·44. It will be noticed that the minimum diameter has decreased more

than the maximum. Again, by comparing the ancient Romans with the modern Italians of Southern Italy, we find that the jaws of the early Romans measured from 2·12 to 2·62, while the jaws of the present Southern Italians measure only 1·94 to 2·69."*

Whether the observations he records are sufficiently extended to warrant quite so unqualified a statement as this, is perhaps open to question, but in the narrowness of the dental arch which seems in general to be associated with protrusion, we have, I believe, on merely mechanical grounds, an important determining cause of the deformity.

The conclusions then which I think we may draw from the points to which I have called attention are: (1) That protrusion (where it is not due to external mechanical causes) is not simply a deformity of the front teeth, but one in which the arch as a whole is involved; (2) that it cannot be altogether regarded as a deformity *sui generis*, but is, in many cases, simply an alternative result of the action of the same causes which produce general crowding of the teeth, transitional forms being seen which exhibit both abnormalities in combination; (3) that if not actually found in the temporary teeth,

* Talbot, "Etiology of Osseous Deformities of Head, Face, Jaws and Teeth," p. 67.

it is at least foreshadowed in a large number of cases by posterior occlusion of the lower temporary molars; and (4) that in estimating the relative importance of the different factors concerned in its etiology, a large share as a determining cause must be assigned to the narrowness of the dental arch.

In a short paper like this, it is obviously impossible to discuss at length all the factors concerned in the production of such a deformity as the one under consideration. I have contented myself with calling attention to two, the importance of which has so far rather perhaps been undervalued than unobserved. Of the shortness of the vertical ramus of the mandible, the influence of the variations of its angle, the rising of the lower incisors and their impingement on the upper gum or teeth, and the influence of the lower arch in determining the character and extent of the protrusion of the upper—of these and their varying combinations there is much to be learnt before we shall be able to discriminate fully between the different varieties of the deformity and arrive at any adequate classification of them, and yet it is evident that even an approximate classification might modify considerably the usual routine method of treatment. Here we have matter for further study, the value of which from a practical point of view cannot easily be overstated.

I am anxious here to express my thanks to several friends for assistance gladly given to me, to Professor Young of the Owens College, for placing skulls and other specimens at my disposal; to my partner, Mr. C. R. Morley, for the loan of models of several cases; to Mr. David Headridge, for help in measuring boys at one of the industrial schools, and also in measuring models; to Mr. J. A. Lees, for carrying out my ideas in contriving or altering instruments; and to him and my pupil, Mr. E. Irwin, in the preparation of models; and to Mr. W. F. Forsyth, for helping me to measure skulls at the College of Surgeons museum.

Discussion.

The President said he had noticed in some cases of protrusion that the patients suffered from post-nasal growths. Possibly that might have something to do with the protrusion, though he was not prepared to say in what way, but cases continually presented themselves where the two conditions were associated.

Mr. David Hepburn said the Society owed a deep debt of gratitude to Mr. Campion for his excellent paper on a very important and difficult subject. He had thrown much new light upon it, and this would doubtless give rise to further thought and investigation. Of course they could not but think of the influence of heredity in the condition called "superior protrusion," and no doubt in many cases the peculiarity was one which was inherited, perhaps from one or both parents; still, on the other hand, there were an extraordinarily large number of cases which appeared to spring up *de novo*, the child as it grew developing the abnormality of the jaw and teeth without traces of it being discoverable in the parents. He had two or three very pronounced cases under treatment at the present time, in which the parents had perfectly normal arches and particularly fine sets of teeth with normal bite, and yet the children, or perhaps one child out of the family, had developed this condition of protrusion.

Whether it was due to some state of development of the cranial bones at a very early stage imparting a peculiarity to the jaws as they developed at a later date, or whether it arose merely from an abnormal growth of bone on certain portions of the jaw, was very difficult to decide. It seemed that the abnormality was more evident at a certain time of

life than at another, apparently commencing as a rule with the eruption of the upper permanent teeth, increasing in intensity for three or four years, and then ceasing. He had risen, however, particularly to mention a case which had come under his notice quite recently. He regretted that he had not up to the present been able to obtain a model of it, but he would do so, and would submit it to Mr. Campion for examination. It was a case of pronounced "superior protrusion" in a child aged $4\frac{1}{2}$ years. He had occasionally noticed a slight advance of the superior temporary incisors, and he had sometimes seen in children conditions which he thought indicated a future state of protrusion, such, for instance, as an abnormally high alveolus, with two rounded eminences above the temporary incisor teeth. This particular child, however, a very bright little fellow, whose parents had perfectly normal jaws, had distinct "superior protrusion," to the extent of about half-an inch. No doubt others might have seen such cases, but as that was the only one that had come under his notice he thought it worth mentioning.

Mr. Storer Bennett said he very much regretted the failure of the lantern just at the last part of the paper, because in the first place it had prevented their seeing one or two more of Mr. Campion's extremely interesting slides; and secondly, because it had prevented his (Mr. Bennett's) having the opportunity of showing a few slides which he had prepared, and which would have been of interest in illustration of some observations he wished to make with regard to the subject of superior protrusion. On the table there were four specimens from which photographs were taken, and to which he would draw attention. As far as he could gather, Mr. Campion made no mention of the extreme shortness of the molars in these cases. It was a matter of common observation in superior protrusion that the molars were extremely short, that is, they were erupted to a very slight extent, and it was very well shown in some of the photographs exhibited, in which the shortness was very obvious. He thought that had a very large influence in determining these cases of superior protrusion.

Then, as another element, they had of course to do with a higher portion of the lower incisors and their noticeably fan-shaped arrangement. The lower incisors biting against the backs of the upper ones, and, later on, against the gum, drove the upper teeth forward. The reason for the increased height of the lower incisors might be two-fold. It was in many cases brought about by difficulty in the eruption of the lower canines. On examining one of the specimens on the table it would be seen that the lower canines were pressing against the roots of the lower incisors and driving them inwards. There was thus shown the commencement of the fan-shaped arrangement of the lower incisors. In a second specimen it was more marked still, and this was, he thought, brought about by the sides of the crowns of the lower canines pressing against the roots of the incisors, driving together the apices of their roots, with the result of course that the crowns were spread. Then, as the lower canines tended to erupt, they would tend to drive up the incisors farther and farther. Another of the specimens showed very distinctly the fan-shaped arrangement of the lower front teeth in connection with superior protrusion. He thought the rising of the lower incisors was due to this difficulty of eruption of the lower canines, and that the biting of the lower incisors against the upper ones was not prevented —as it should be—in consequence of the extreme shortness of the molars. The photographs shown by Mr. Campion illustrated very beautifully this extreme shortness, and the same thing was very noticeable in the models. Those were two of the factors starting superior protrusion. The moment the front upper teeth began to travel forward the lower lip invariably dropped behind, and that had a very large influence in continuing the protrusion once it was started. After a time the upper lip was drawn up so as to lie more over the roots than over the crowns, thereby ceasing to counteract the effect of the lower lip. The lower lip drove the teeth further forward, till a certain distance was reached, when it no longer influenced them. These were three points that had large influence in such

cases. The thanks of the Society were certainly due to Mr. Campion for the extremely interesting nature of his paper.

The PRESIDENT said that they hoped to see Mr. Bennett's slides on a future occasion.

Mr. CAMPION said that Mr. Hepburn had alluded to "heredity" as a factor in some of these cases. Probably all would readily agree with Mr. Hepburn that it was, but it was a question to his mind whether even heredity did not act, at any rate in many cases, through the narrowness of the arch. From his observation of such cases there appeared to him to be really very little doubt that the narrowness of the arch was a very large determining factor —not the only factor by any means, for there were many others. Mr. Bennett had kindly supplemented the paper by alluding to one or two more, but as he (Mr. Campion) had said, it was quite impossible to treat all these factors in one short paper. He therefore preferred to confine his attention to two, and to discuss those as thoroughly as he could in the time allotted. Mr. Hepburn had referred to a case of superior protrusion in a child of 4, and it curiously happened that a similar case was to have been shown in one of the slides at the end. He had there a model of a child of 4 with very pronounced protrusion of the upper and receding of the lower incisors, in which there was a very undoubted history of thumb sucking, and in that case the molar articulation was normal. A most interesting point alluded to by Mr. Bennett was the shortness of the molars and the uprising of the lower incisors. That was a point which he very much wished to investigate, and he should be extremely interested to hear Mr. Bennett's views upon it. He had often wondered whether the uprising of the lower incisors was some abnormality in itself, or was simply due to the fact that the molars had not come up to the proper level, and that, therefore, the rising of the incisors was apparent rather than real. That was a very interesting point on which he had formed no conclusion, and on which he had really made no investigation. Mr. Bennett's allusion to the difficult eruption of

canines as a cause of the fan-shaped appearance of the lower incisors was also very interesting—it seemed to afford a rational explanation of the appearance ; but going still further back, he thought that the difficult eruption of the canines and the consequent compression of the incisor roots was really due to an abnormal narrowness of the arch. Those, he thought, were the main points touched upon, and he had only, in conclusion, to thank the members for the very patient hearing they had given to him in what he feared was a dry exposition of part of the subject. A large number of models of the deformity were on the tables for inspection.

The PRESIDENT offered the thanks of the Society to Mr. Brunton for his casual communication, and to Mr. Campion for his very interesting paper.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

May 6, 1895.

Mr. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

President, in the Chair.

The Minutes of the last meeting were read and confirmed.

The President said their first business was to appoint two auditors to audit the yearly accounts. Mr. Curnock and Mr. Sidney Spokes were chosen, and consented to act.

The President announced that since the last meeting they had heard with regret of the death of one of their late Presidents, Mr. James Parkinson, and also of a member of the Society, Mr. Mark J. Bloom, of Dublin. The Council had written letters of condolence to the families of both those gentlemen. There was also one other name that should be mentioned, although it was not that of a member of the Society, Dr. Ludwig A. Weil, of Munich, who had died since the last meeting.

The following gentlemen were proposed as non-resident members of the Society:—A. W. W. Hoffmann, L.R.C.P. Lond., M.R.C.S.Eng., L.D.S.Eng., 30, The Parade, Leamington; James Sim Wallace, M.D., B.Sc., 29, St. James' Road, Kingston-on-Thames.

The following gentlemen were balloted for and elected members of the Society:— Leslie Maury Stocken, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng., Winchester House, Ealing (resident); Francis R. Flintan, L.D.S.Eng., Tower Lodge, Weybridge, Surrey (non-resident).

The Librarian reported the receipt of the usual periodicals and exchanges. He also stated that the new List of Members would be issued after the annual meeting in June, and that he would be glad to receive any corrections of addresses or additional qualifications.

The Curator said the first specimen he had to present to the Society was one given by Mr. S. W. Turton, a student of the Dental Hospital of London. It was an upper model of an extreme example of the saddle-shaped arch, the first molars and bicuspids on both sides being very much driven in towards the middle line. One central only was present, the other having been extracted some months, or perhaps years, previously. He had not himself seen the patient, but the model was extremely interesting, showing what very great deformity was sometimes met with in such cases.

The kind of irregularity usually met with among temporary teeth was crowding of the lower central incisors, causing a twisting of the median edges towards each other, forming a sort of V. Quite recently Mr. Bennett had received, also from a student of the Dental Hospital of London, Mr. J. W. Dalton, the upper and lower models of a girl aged 4 years, showing this deformity, and also—which was still more interesting—the models of a brother of this child, aged 2, showing also the same deformity. Of course, crowding of the temporary teeth in itself was rare, but it was difficult to quite understand how crowding of the central incisors could take place before even the second temporary molars had erupted. In the child aged 2 the first temporary molars were cut, and the teeth anterior to them; but the second temporary molars showed no sign whatever; nevertheless, the same kind of deformity was well marked; and there was also a crowding of the lateral incisors. The models, being those of brother and sister, together made an extremely interesting series.

It might be within the memory of members that some months, or even years ago, Mr. Macleod showed a very extraordinary skull which belonged to a museum, and was therefore only available as a loan to this Society. The skull seemed to have the most remarkable collection of abnormalities that he had ever met with. Though an adult skull, the right upper canine and right second permanent molar were unerupted, the latter lying horizontally with its crown directed forwards, and having between two of its roots two enamel nodules. On the left side it had a transposition of the first bicuspid and canine, and both bicuspids were so twisted that the buccal sides were turned inwards towards the palate. The left second molar was not fully erupted, and it also had two enamel nodules. Mr. Macleod was good enough to leave this specimen in his hands for the purpose of taking a cast. It was not a very easy specimen to duplicate, but he had taken a cast which he would present to the museum, and which was, he thought, a very beautiful specimen of what might be done by the gelatine process introduced some years ago by Mr. Whitehouse. By no other means would it have been possible to obtain so successful a cast. It showed three of the four enamel nodules, but unfortunately the fourth, which stood on the anterior surface of the left molar, was so very difficult of access—in fact could hardly be seen at all until the tooth was taken out—that to get a cast *in situ* of it was absolutely impossible.

Mr. Gartley presented a specimen to the Museum, showing transposition of a first upper bicuspid and a canine.

Mr. Brunton presented models, showing transposition of laterals and canines occurring in a patient 54 years of age.

Mr. Schelling presented some interesting specimens of old mechanical work which had been in the possession of Mr. A. Pitowski, a former member of the Society.

Mr. Coxon asked Mr. Bennett how he had proceeded to get the cast which he had exhibited.

Mr. Brunton asked what grounds Mr. Bennett had for pronouncing the skull to be that of an adult.

The Curator said that the appearance of the sutures and the position of the teeth was a considerable guide. The bicuspids were erupted; the second molar on the left side was not fully erupted, but was well through the bone, and there was a considerable cavity where the wisdom teeth at some time had been. Unfortunately, either at the time the skull was prepared, or at any rate at some time before he had the opportunity of seeing it, the wisdom teeth dropped out. He had, therefore, no means of judging how far the development of these teeth had proceeded, but the crypts were large, and therefore they must have been pretty well advanced. In reply to Mr. Coxon, he might state that the process adopted was perfectly well known. It was described by Mr. Whitehouse some years ago, and they were all familiar with it. In this particular instance nothing was done to the skull beyond painting it with a thin coating of oil to prevent the liquid gelatine sticking to it. Nothing else was done at all.

The Nature of the Transparent Zone of Dental Caries.

By F. J. Bennett, M.R.C.S., L.D.S.

Mr. President and Gentlemen, — Amongst the phenomena of dental caries there are none of greater interest, none upon which opinions still differ more, than those relating to the zone of transparency. A true knowledge of the nature of this appearance is desirable, not only in relation to dental caries, but also as throwing light on the properties of dentine itself. For, should the zone of transparency prove to be a manifestation of a physiological activity of the living parts of dentine, that structure would be brought into much closer affinity with the other tissues of the body than would be possible to ascribe to it otherwise.

The evidence which I place before you this evening may be considered as the outcome of an enquiry, on my part, as to how far the zone of transparency favours the view of vital activity in response to the stimulus of caries, or the reverse. Dentine in this condition has formed the subject of so many able and well-known

enquiries on the part of others that I can do no more than summarise the results. The opinions generally resolve themselves into the question: Is the transparency due to increased calcification of the part or not? There can be no doubt that this point clearly proved would go far to settle the matter.

The older view, that it is an area of increased density, due to consolidation of the fibril, is advocated by Sir John Tomes, Dr. Magitot, Dr. Miller, and others; whilst the later view, supported by Messrs. Leber and Rottenstein, Professor Wedl, Dr. Black, and Dr. Abbott, regards the area as one of partial decalcification and disintegration. Mr. C. Tomes, perhaps, inclines to the latter class of opinion. Moreover, some of these observers regard the zone of transparency as identical with the horny translucency in old roots of teeth.

The most damaging argument against those who hold the view of increased calcification of the fibril, is that which asserts that a transparent zone is to be found in natural teeth mounted on plates, and which have subsequently been attacked by caries. For it would be difficult to understand how a fibril could become calcified when once the tooth was dead. However, the presence of the transparent zone in relation to caries, in such teeth, appears to

be doubted by Dr. Miller. But although he speaks of having "split about sixty, which appeared especially suited for the purpose, one case only revealed a phenomenon resembling transparency, but even in this case it was not possible to say the change was not brought about whilst the tooth was still living." It must be remarked, however, that Dr. Miller does not mention having examined the specimens under the microscope. Dr. Miller, returning to the general question of the zone of transparency, says: "A decalcification, however, has most certainly not taken place in the transparency in question."*

The matter being left an open question, I determined to examine specimens stained with gold chloride, and further to select, amongst others, teeth in which there was a partial or complete arrest of the caries, as in these the fibril might be supposed to be calcified from the fact of the arrest.

With two obvious exceptions the teeth were all fresh, with living pulps. No acid whatever was used in any part of the process. They were ground, polished, soaked in the gold chloride solution, and finally mounted in glycerine jelly.

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* "Micro-Organisms of the Human Mouth," p. 161, 1890 edition.

The dentinal fibrils and the carious portions are the parts deeply stained.

I will now have the specimens shown on the screen and describe the appearances of each.

No. 1 (see fig. 1, Plate I.) shows the general relation of the parts in a specimen in which partial arrest of caries has taken place. Below, the margin of the pulp cavity is seen with traces of the cornua. The normal dentine is seen above, then a well-marked zone of transparency, roughly following the contour of the pulp cavity; finally, the darkly stained area of partially arrested decay. It will be seen that this surface is flat above; no doubt in an earlier stage it may have been less regular, but the wear of mastication has reduced it to a common level. The surface had become polished and fairly hard, and nature had all but effected a cure, save where the rough edges of enamel remained and formed lodgment for food. The section being cut quite perpendicular to the carious surface, the zone of transparency is nearly uniform in thickness throughout. Sometimes a misleading appearance is produced as to the thickness of the zone, where various surfaces of the tooth are attacked by caries at the same time, then the various areas of translucency mingle and become irregular patches.

In relation to a subsequent specimen I will

PLATE I.

FIG. 1.

FIG. 2.

PLATE I.

Fig 1.—General relation of parts in a longitudinal section of partial arrest of decay. The irregular white line represents the area of transparency which separates the normal dentine below, from the decayed portion above. At the lateral margins of the latter, decay is active; in the central part of the upper portion the decay is arrested.

Fig. 2.—Transverse section of partial arrest of Caries. Light coloured islands of secondary dentine, bordered by normal dentine, with the white zones of transparency, are seen. The active caries occupies one darkly-stained margin. The entire masticating surface was in a condition of partial arrest of caries, and the section was made parallel to this, and through the arrested tissue. The specimen in grinding down has been worn through in two places.

PLATE II.

FIG. 3.—Higher magnification of a portion of the white area of transparency in the previous figure. In the lighter portions the tubes are thickened and present the pipe stem appearance.

FIG. 4—From a portion of the zone of transparency, in a specimen of partial arrest of caries. The tubes are thickened and enlarged.

PLATE II.

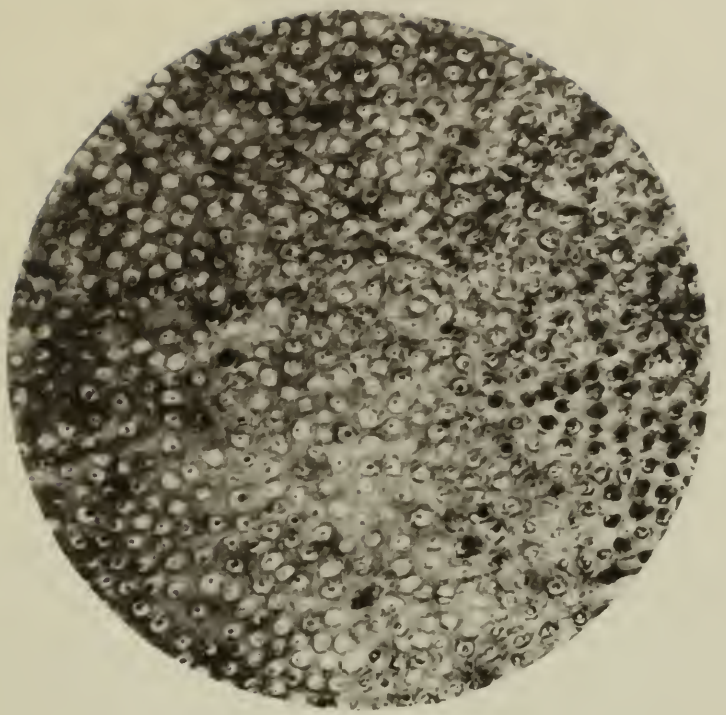

FIG. 3.

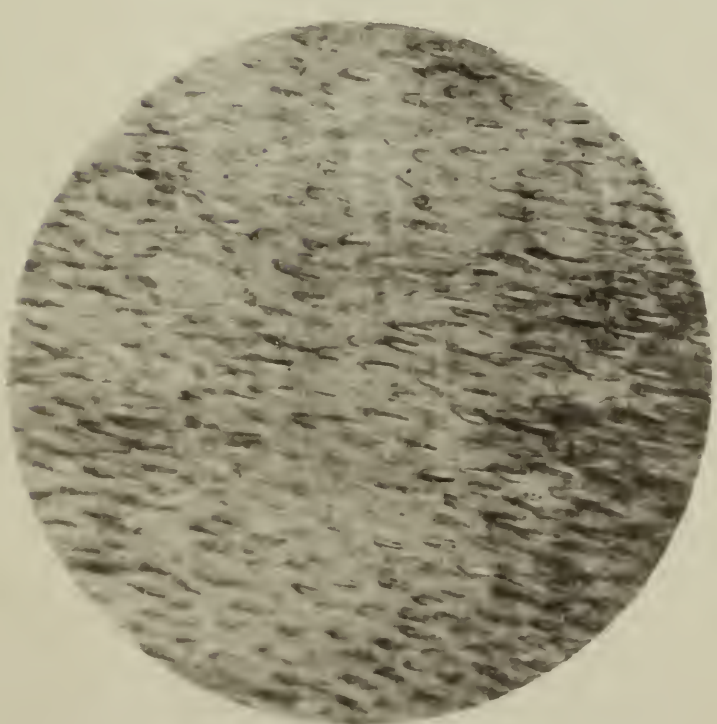

FIG. 4.

here point out that if in a tooth similarly affected a transverse section be made on a level with the transparent zone, the slice would cut through a core of normal dentine surrounded by a ring of transparency, the remainder being the hardened arrested caries; secondary dentine might also appear in the centre of the core.

No. 2 is somewhat similar, but here the decayed surface has been worn away at the prominent crest, exposing the normal dentine, whilst in the valleys, caries is still present. The transparent zone crops out at the foot of the crest.

No. 3 is a higher magnification of the same specimen. The transparent area is seen, the normal tubes rather suddenly become indistinct on entering the zone, while the dark axial line of the fibril almost entirely disappears. The tubes lie as in a glassy matrix. Here and there the axial portion of the tubes is beaded. These appearances are seen under the microscope and require a higher magnification.

No. 4 (see fig. 2, Plate I.) shows a transverse section of partially arrested caries at about the level described in the first specimen. The four islands of secondary dentine are surrounded by areas of primary dentine, with rings of transparency. The rest is arrested caries, with active caries, the latter forming a dark margin on one

side. The section is thin, and cut through in places.

In one or two specimens, I fancied there was evidence of the dentinal tubes being enlarged in places within the zone of transparency, and concluded that the only sure way of settling this point was to make the section in such a way as would cut the tubes across, as nearly as possible at a right angle; in this way the exact relative size of fibril, tube, and matrix could be measured in the various areas. The present specimen was made for this purpose.

No. 5. (see fig. 3, Plate II.).—Under this magnification, and from a part of the ring of transparency, this specimen is seen. The tubes are clearly seen to be thickened and enlarged, and present the pipe-stem appearance. It is the thickening of the tube or sheath which is the important point. This specimen perhaps includes some normal tubes. It is quite impossible to see in such appearances as these the slightest suggestion of an increased calcification of the fibril, in fact all point to an opposite conclusion —a close resemblance to the pipe-stem appearance of incipient caries. These appearances are found in more than one part of the transparent zone, and are for your inspection under the microscope.

No. 6 is a less magnified view of the same, showing the transparent area from which such appearances as the last are seen.

No. 7.—A specimen of partial arrest, the zone clearly showing, and a central spot from which the next photograph is taken.

No. 8. (see fig. 4, Plate II.).—This again shows the tubes thickened very clearly in the translucent zone. It is well seen under the microscope.

No. 9.—The next specimen represents a longitudinal section of a natural tooth mounted on a plate and subsequently attacked by caries. The concave margin is the part next the plate, and is the situation usually affected with caries. The transparent zone is, I think, clearly marked, and unites at the sides with the horny peripheral layer not uncommonly seen in old dead teeth. Beading and varicosity can also be seen under the microscope.

No. 10.—Following my plan of examining the tubes when cut transversely, I selected an upper central incisor, which had been mounted on a plate and afterwards affected with caries, in a similar situation to the last, making a section parallel to the front or labial surface. The lower margin of the photo represents the cervical region with the caries spreading upwards. The top is the cutting edge of the tooth. The zone of transparency is best seen in the lower left corner, and here the tubes are cut at a right angle and are seen in the next photo.

No. 11.—The transparent zone occupies the whole of the upper part; below is the carious portion. In about the middle of the specimen the tubes are cut directly across, and I fancy show a distinct thickening. However, the specimen is under the microscope for you to form your own opinion.

To summarise these results, I would say that inasmuch as enlarged and thickened tubes can be demonstrated in parts, I do not say in every part and in all cases, we cannot regard the zone of transparency as an area of increased calcification, and that the phenomena point to the zone as representing a precursory stage of dental caries.

Discussion.

Mr. Wynne Rouw said Mr. Bennett had stated that the transparent zone was not due to calcification in the tubes. He should like to know what it was due to, because at present he was completely in the dark on the subject.

Mr. Cunningham suggested that it might be perhaps well to examine the microscopical sections before proceeding further with the discussion, because one felt a little difficulty in criticising and coming to conclusions upon demonstrations made upon the screen. With regard to some of these, he did not quite see them with the eyes of the demonstrator himself, and thought that possibly the thickening of the tubes, and so on, were somewhat owing to the diagonal cut of some of the tubes, causing them to exhibit a kind of appearance that might be seen in teeth that were not pathological at all. He believed that he could reproduce a photograph on the screen which would be very like one of Mr. Bennett's, and yet would not point to anything resembling the zone of transparency or to any pathological condition. If they examined the specimens they might be able to discuss the subject better.

Mr. Mummery said the paper was a very interesting contribution to the pathology of caries. He thought it possible that the occurrence of the enlarged tubes and tube walls might be accounted for in another way than that described by the author. It was well known that there was an area of decalcification in caries described by Miller, and that this area was found in advance of the micro-organisms. In these cases where there had been a spontaneous arrest of caries, it was possible there might have been an old transparent zone and a fresh zone of partial decalcification due to a

further advance of caries. Afterwards, when the caries had been arrested, both zones were shown, that was to say, there was a transparent zone invaded by a zone of fresh decalcification, and so a few micro-organisms and also the thickened tubes might be seen. It would be interesting to know whether the specimens shown, which he believed had been all ground, were at all soft, if they could have been cut with an excavator, because, of course, in Miller's zone a portion of softened dentine could be cut out perfectly free from organisms.

Mr. Sefton Sewill said that having had an opportunity of examining a large number of such specimens, he fully agreed with Mr. Bennett in the conclusions he had drawn. With regard to the theory of vital action, seeing that the tooth structure was composed of 75 per cent. or more of mineral matter, and contained no blood vessels, and that it was impossible to point out any place in the body where vital action took place in the absence of any blood vessel, he thought it was evident that there could have been no vital action in the cases referred to. He thought the specimens would have been very interesting if they had been stained for micro-organisms. They could then have seen more exactly where the micro-organisms had penetrated, and might probably have seen, as Mr. Mummery had pointed out, that they must have gone very near indeed to the zone of translucency. He thought the appearances shown might be perfectly well produced by decalcification and by nothing else; also that the pipe-stem appearance was sufficiently accounted for by the swelling of the dentinal tubules. Several gentlemen had mentioned the fact of these appearances being seen in teeth worn on artificial plates. They must have resulted from dental caries produced artificially, and no doubt Mr. Bennett had put them entirely on the right track as showing that there was no question of vital action in the zone of translucency.

Mr. Storer Bennett said he wished to draw attention to one point which seemed to have escaped attention. The author had stated in the early part of his paper that this was an investigation set on foot for the purpose of deter-

mining a certain thing, namely, whether there was increased calcification, or, on the other hand, softening in the zone of translucency. The evidence of the paper went distinctly to show there was no vital action in the tooth, that there was no attempt at calcification to arrest the approach of caries; but on the other hand, what had formerly been described as the translucent zone, and which was supposed at one time to be a barrier set up against advancing caries, was pretty clearly shown by the specimens to contain enlargement of the tubes, not contraction, as there must be if excessive calcification had taken place in them. He did not quite understand from Mr. Mummery whether he proposed to suggest that there were two zones of translucency—one the old zone described by the earlier writers, and the other one undoubtedly due to acids, as described by Dr. Miller—whether he wished to speak of two zones or only one zone, one and the same thing. The point he wished to enforce was that the paper, as far as he could understand, was specially aimed at examining the question as to whether there was or was not a vital action in these teeth to arrest the caries. The fact that this zone was found very well marked in teeth that had been worn on artificial plates appeared in itself a most convincing argument against any vital action being possible in caries.

Mr. Mummery said that what he meant to convey was, that whatever the cause of the translucent zone, whether produced by calcification or decalcification, he thought that the appearances shown suggested an encroachment upon the zone first formed, by the area of decalcification in front of freshly advancing micro-organisms. The two zones had encroached upon one another, there had been caries and arrested caries alternating, and the decalcifying area had really worked, as it were, into the zone of translucency, because in most of the specimens the peculiar appearances of the dentine, showing some alterations in the tubes, were near the line of micro-organisms, not very far down in the zone of translucency.

Mr. J. F. Colyer asked Mr. Bennett whether he was quite sure that in the specimen of the incisor of which

sections had been shown, caries had not started previously to the mounting of the tooth on the plate. He would have liked to have seen Mr. Bennett deal with the chemical analyses brought forward by Miller in his book, and which he (Mr. Colyer) always considered the most telling argument against the devitalization theory. He would also ask how Mr. Bennett accounted for the translucent appearance obtained in the dentine long before the whole of the enamel was quite disintegrated. Every now and then they met with a translucent appearance in teeth where there was no caries, but where they had abrasion or erosion. The appearance appeared to be exactly similar to that which was got in caries.

The PRESIDENT said he was afraid they could hardly adopt Mr. Cunningham's suggestion of examining the specimens before further discussing the paper. Their object was rather to bring the meeting to an early close, so that there might be time for an examination of the specimens under the microscope subsequently. Therefore, if no member had any other remark to make, he would ask Mr. Bennett to reply.

In reply to the remarks on his paper, Mr. F. J. BENNETT said: Mr. Mummery's point was that the transparent zone had subsequently been affected by caries, that the old caries might have produced the transparent zone, but that a later attack of caries had invaded the transparent area and caused the enlargement of the tubes in this area. As a matter of fact there was but one attack of caries; although it had continued active at one point, it had become arrested at another. The flat masticating surface from which the section was made had the polished and eburnated appearance of arrest, although part of the circumference at the jagged enamel margin had the caries still active. But enlarged tubes in the transparent area were to be found not only near the active caries, but in places far removed from it. Again, if a transparent area had become carious, how was it that it did not also take a stain in a similar manner to that where caries was active? Dr. Miller had said that there was a very small area in front of the advancing caries which did not

become stained. That was so, but not such an area as that under consideration.

Mr. Mummery: A very wide area was frequently unstained.

Mr F. J. Bennett thought that all the transparency shown in the specimen was part of one and the same zone of transparency, and was not of the kind mentioned by Dr. Miller. With regard to the specimen which he handed to Mr. Colyer, there was no trace of decay having occurred previous to the mounting of the teeth on the plate; it was unlikely that carious teeth would have been used for such purposes, and moreover, the places affected with decay were such as could not have been exposed to its influence during life, namely, where the tooth had been cut in half and fitted to the plate, and around its attachment to the pin.

In reply to Mr. Colyer's remark that there was a zone of transparency in attrition and in erosion, he (Mr. Bennett) had made a number of sections, expecting to find evidence of a transparent zone in attrition, and had only been able to demonstrate anything resembling such in one case, and in that one he believed there were also indications of softening. He would be glad to see specimens of transparency in attrition, still more so in erosion. Beyond the secondary deposit at the margin of the pulp cavity, he had not seen the faintest tendency to increased calcification, or to a zone of transparency in erosion.

Mr. Cunningham had suggested that specimens on the screen were a little deceptive, and that when they came to the microscope itself they might read a different story. All he (Mr. Bennett) could say was that Mr. Cunningham was welcome to make a close and critical examination of the microscopical specimens themselves, which were on view in the next room, and to see if they did not accord with the photographs.

The President tendered the thanks of the Society to the reader of the paper and to those who had brought forward Casual Communications.

Odontological Society of Great Britain.

ANNUAL MEETING.

June 10, 1895.

MR. FREDERICK CANTON, M.R.C.S., L.R.C.P., L.S.A., L.D.S.

PRESIDENT, IN THE CHAIR.

THE Minutes of the last meeting were read and confirmed.

The ballot for the election of officers was opened, and Mr. GEORGE HERN and Mr. G. O. RICHARDS were appointed as scrutineers.

The PRESIDENT stated that the necessary obligation forms had been signed by the following: Frank C. Porter, L.R.C.P.Lond., M.R.C.S.Eng., L.D.S.Eng., 12, Oxford Street, Nottingham; G. Arthur Peake, Alma House, Cheltenham; Francis R. Flintan, Tower Lodge, Weybridge.

The following gentlemen were elected non-resident members of the Society: William Jarvie, M.D.S., 105, Clinton Street, Brooklyn, New York; John William Tomlinson, L.D.S.Eng., 8, Warrior Square, St. Leonards-on-Sea.

The TREASURER (Mr. S. J. Hutchinson), in reading his annual report, said: I shall not detain you very long, because the finances of the Society are in a flourishing condition. The total receipts have been £541 2s. 6d., and the total expenditure £444 6s. 10d., leaving a balance of

Odontological Society's Accounts for the Year November 1st, 1893, to October 31st, 1894.

Dr.	£	s.	d.
To Annual Subscriptions	441	0	0
,, Arrears	19	19	0
,, Entrance Fees	76	13	0
,, Sale of Transactions, &c.	3	10	6
	£541	2	6

Cr.		£	s.	d.	£	s.	d.
By Rent					150	0	0
,, Fire Insurance					3	7	3
,, Meetings.	Baker—Lantern Exhibition	1	11	6			
	Bale—Notices, Postages, &c.	26	11	3			
	Swift—Microscope	13	0	0			
	Camps—Refreshments	23	8	4			
					64	11	1
,, Library.	Lewis—Books and Periodicals	3	13	6			
	Purchase of Books	5	2	8			
	Camps—Sub-Librarian	5	5	0			
	Thomas—Sub-Librarian	14	10	0			
	Thomas—Binding	3	6	6			
					31	17	8
,, Museum.	Curator—Money Disbursed	5	5	0			
	Courtice—Attendance	2	5	0			
	Ebbs—Attendance	12	19	6			
					20	9	6
,, Transactions.	Bale & Sons	74	6	6			
	Hon. Editor—Expenses	2	0	0			
	Engraving	1	0	0			
					77	6	6
,, General.	Bale—Notices, Postages of Transactions, &c., Stationery, Printing Resolutions of Council, &c., &c.	82	4	0			
	Treasurer—Postages	2	12	6			
	Secretary—Postages	1	0	0			
	Cheque Book and Bank Charges	0	8	4			
	Camps—Gratuity	5	5	0			
	Brown & Son—Accountants	5	5	0			
					96	14	10
					£444	6	10

Odontological Society's Accounts for 1893-94—*continued.*

	£	s.	d.
Balance at Bank, October 31st, 1893	159	19	9
Gross Receipts, November 1st, 1893, to October 31st, 1894	541	2	6
	£701	2	3

	£	s.	d.
Gross Expenditure, November 1st, 1893, to October 31st, 1894	444	6	10
Consols purchased, March 15th, 1894, £100 2s. 6d., costing	100	0	0
Balance at Bank, October 31st, 1894	156	15	5
	£701	2	3

	£	s.	d.
Gross Receipts for the year, November 1st, 1893, to October 31st, 1894	541	2	6
Gross Expenditure ,, ,, ,, ,, ,,	444	6	10
Surplus of Receipts over Expenditure	£96	15	8

INVESTMENT ACCOUNT.

	£	s.	d.
Amount in £2 15s. % Consols, October 31st, 1893	3571	1	0
Consols purchased, March 15th, 1894, cost £100, producing	100	2	6
Dividends, January, April, July and October, 1894, £97 8s. 2d. invested producing	96	10	3
Amount in £2 15s. % Consols, at October 31st, 1894	£3767	13	9

Examined and found Correct, May 14th, 1895.

G. DENNIS CURNOCK,
SIDNEY SPOKES, } *Hon. Auditors.*

We have made up the above accounts from the books and vouchers of the Society, and certify them to be correct.

January 14th, 1895

HENRY BROWN & SON, *Chartered Accountants*,
13, Victoria Street, London, S.W.

receipts over expenditure of £96 15s. 8d. Our invested capital in 2¾ per cent. Consols on October 31, 1894, was £3,767. I am glad to be able to tell you that with the dividends which have accrued, and some further small investments, the total of our invested capital to-day is £4,026. Another point I should like to emphasize is this, that out of a total of 377 members there are only 63 who have not paid their subscriptions for the current year in advance. I think that is a very gratifying circumstance. Out of those 377 members there are 87 who paid through the Bank, and I should like to take this opportunity of again thanking those gentlemen who do this, as it materially lessens the clerical work and ensures also greater accuracy in the amounts being properly paid into the Society's account. Those gentlemen who were present at the Annual Meeting, when it was decided to alter the bye-laws so that the Annual Meeting should be moved from January to June, will remember that there was some little discussion as to how the financial year should be regulated, and I think it is desirable to take this opportunity of reading a letter from the chartered accountants who audit the Society's accounts, giving an answer to the question which I asked them, with regard to the financial year. It seems anomalous probably to many of you that the financial year should terminate on October 31, and the Annual Meeting should be held on the first Monday in the following June. You will see, however, that our bye-laws were so altered that any gentleman nominated for membership at the January meeting would only pay the entrance fee and subscription for the current year, therefore that is exactly the same thing as it used to be, when a member was nominated at the Annual Meeting, but did not have to pay any subscription for the current year. I will read this letter from the Accountants in order that it may be placed on record in the *Transactions* :—" Dear Sir,—In reply to the question of your letter, in our opinion it would cause great confusion, if the date of the accounts to which they are now made up, was altered, unless at the same time the date of the subscription was changed, and we think this

can hardly be done without a large amount of explanation, which would require considerable correspondence, and even then we believe many of the members would be dissatisfied at the alteration and at the result." I think we may take it, therefore, on the authority of these gentlemen, that it is desirable to continue the present date of the financial year, terminating on October 31, in the year previous to the Annual Meeting. Of course it only makes a difference of a few months at the most. The Annual Meeting was formerly held in January: now it is held in June, and the financial year terminates in the October of the previous year. I think what I have said ought to be placed on the books of the Society for the benefit of future Treasurers.

The Librarian (Mr. W. A. Maggs) reported the following donations to the library: Mr. Harry Rose's works "On Vulcanite" and "Continuous Gum Work" by the author; Mr. Hopewell Smith's "Dental Microscopy" by the author; *Transactions of the American Dental Association;* "The North American Fauna," Washington, U.S.; *Transactions of the World's Columbian Dental Congress*, Chicago, U.S., 2 vols; *Transactions of the New York Odontological Society.*

The Librarian presented the annual report of the library. He stated that the books added during the year had been announced from month to month, so that it was unnecessary to reiterate their names. The number of books borrowed from the library from January 1, 1894, to the present date was ninety-two. The list of exchanges had been increased, and it now included the following periodicals and journals:—*British Dental Association Journal, British Journal of Dental Science, British Medical Journal, Dental Hospital of London Students' Society, Dental Record, German Odontological Society, Guy's Hospital Dental Society, Guy's Hospital Reports, International Dental Journal, Lancet, Medical Society of London, National Dental Hospital Students' Society, Royal Dublin Society, Royal Institution of Great Britain, Royal Medical and Chirurgical Society, Royal Society of London, Smithsonian Institute.*

The *Transactions* were presented to the libraries of the Royal Colleges of Physicians and Surgeons, and to the University of Berlin.

Other periodicals regularly subscribed for by the Society were :—*Dental Cosmos*, *Journal of Anatomy and Physiology*, *Journal of Pathology and Bacteriology*.

The following are sent gratuitously, and are received with thanks :—*Chicago Dental Review*, *Dominion Dental Journal*, *Journal of the Pharmaceutical Society*.

As was well known to members, the library was open on Mondays, Wednesdays, and Fridays, from 6.40 p.m. to 8.45 p.m. This arrangement has been in force since the last Annual Meeting in January, 1894, and the sub-librarian was in attendance upon these evenings. It was to be regretted that the library was not more used by members ; and unless it was more frequented as a reading room, the Council might not feel justified in retaining the services of the assistant. Some surplus volumes and numbers of the *Transactions* had been disposed of during this year, and there were still some copies that might be obtained. These sales had proved acceptable to some of the members, as they had been enabled to complete their series, and it had also permitted some relief in the matter of space in the library, an item of great consideration. It was desirable to call attention to the fact that there was a Suggestion Book on the library table in which the name of any book required might be entered, and the Council was always glad to consider favourably such suggestions.

The Curator (Mr. Storer Bennett), in delivering his annual report, said : I have a somewhat lengthy list of specimens to present to the Society this evening, it so happening that during the last month a very great number have been sent to the Museum by two or three different members.

To begin with, I have just received from Mr. Gartley, in response to a request made some little time ago, some specimens of bone work in which the teeth have been carved out from the solid piece of ivory. I should be very glad indeed if any of the older practitioners who possess speci-

mens of bone work with natural teeth mounted upon them, and do not specially value these sets, would present them to the Museum. From day to day these things must get rarer, and the time will come when they will have no existence whatever except in our Museums. Therefore it will be a great advantage to us if we can add as many specimens as possible of these earlier forms of artificial work made out of ivory, so that they may be kept as a permanent record.

Mr. Bridgman, of Norwich, has sent a model taken from the mouth of a boy aged 9, in which there are two temporary teeth on the right side of the mouth, which are gemmated. Those teeth were extracted. On the left side of the mouth the two teeth, not gemmated, were also extracted, and Mr. Bridgman has sent the specimens as well as the models.

Mr. Maxey, one of the house surgeons of the Dental Hospital of London, has presented an extremely interesting specimen. It consists of the left upper central and lateral incisors, taken from a boy aged 13. When 6 years of age he received a blow on the front of the mouth which necessitated the extraction of two or three temporary teeth, and as some of the bones necrosed pieces of dead bone were subsequently removed. When the boy came under observation at the hospital at the age of 13, it was found that the left upper central and the lateral were perfectly loose. On their removal the central was found to have no root but merely a cup-shaped depression, showing considerable absorption and an extremely large pulp cavity. The lateral showed that the development of its root had gone on to a larger extent than in the case of the central, but there was a thin twig-like piece of dentine surrounding the pulp which had been dislocated. This was, in point of fact, an extremely good specimen of di-laceration, and, what is not common in such cases, there was a clear history of an antecedent injury. It often happens that these specimens come into our hands with absolutely no history whatever, but in this instance there was the clear history of injury having taken place at the front of the mouth at the age of 6 years.

I have here two ancient instruments for the extraction of teeth, sent by Messrs. Ash, who have received them from a practitioner.

Mr. Merson, of South Molton, has sent several specimens: one is a skull of a cart-horse seven years of age, showing perfect dentition. Another is part of the upper jaw of a young ox, showing the three pre-molars and three molars. There is also the skull of a very old dog and of a vixen fox. The fox has almost complete dentition, but one or two of the teeth are unfortunately loose.

The next five specimens have been sent to the museum by Mr. Morton Smale, who thus makes a most valuable contribution to our museum. First comes the skull of a young lion. We have had in the museum up to the present time absolutely no specimen of a lion's skull whatever, but this being a young one is extremely interesting. It is so, to begin with, because it upsets one's usual means of deciding whether we have to do with the skull of a lion or of a tiger. It may be known to some of the members of the Society, although I do not think it is a matter of common knowledge, and I have never seen it noticed in any text-book, that the way to tell the skull of a lion from that of a tiger is by an examination of the nasal bones. In the skull of the tiger the nasal bones are longer than the bones of the superior maxillæ, and are more pointed, but in the lion the nasal bones are shorter than the superior maxillary bones and are rounded. Of course the great peculiarities of all animals are most marked in the adults, the characteristic differences being less clearly seen in early life. Therefore in this young lion the distinction between its skull and that of a young tiger is less noticeable than if two adult specimens were compared. However, it can quite well be seen that it is not the skull of a tiger even now.

Then we have the skull of a Polar bear, the *Ursus maritimus;* it is exceedingly interesting because it shows the two small pre-molars situated immediately behind the canines, and in the broken left side of the mandible a little supernumerary pre-molar deeply imbedded in the substance of the jaw. How it came to be ever suspected that it was present, unless it was simply the result of this fracture, I quite fail to understand. However, anyone who will examine the specimen will be interested to see this little

tiny tooth imbedded deeply into the substance of the bone. On the other side Mr. Smale has had a window cut in the jaw itself, and it is obvious there is no similar tooth to be found.

Then we have here the skull of an African sheep, showing some remarkable irregularities. The three pre-molars in the upper jaw on both sides are very much crowded together, overlapping one another in a way that is very unusual in the lower animals. This, however, was a domesticated sheep, and therefore perhaps the irregularity is not so surprising as if the creature had been absolutely wild.

The next specimen consists of the two halves of the mandible of a red kangeroo, and on the right side is an enormous amount of thickening from periostitis. There has been an alveolar abscess, and it is easy to see how much new bone has been thrown out.

Lastly, we come to the skull of a young chimpanzee; this shows caries in several situations, and is extremely interesting because it shows a very unusual position for the development of the second permanent lower molar. This tooth is developed lying on its lingual side. Instead of being developed in the lower jaw with the crown upward, and the part which should form the roots downward toward the base of the jaw, it is turned on its side so that the part which should eventually form the root is turned outwards towards the cheek. In looking over that exceedingly valuable collection of specimens which Mr. Smale presented to the Museum of the School of the Dental Hospital of London, I noticed this peculiarity in the specimen of a young chimpanzee, and pointed it out to him, and he found the appearance was identical in both cases. Whether such is always the case, or whether it is a mere coincidence, I am not at present prepared to say.

We have also part of the right upper maxilla with the floor of the antrum enclosing a second bicuspid and first and second molars from a man aged 45. He had received a kick on the jaw which broke this piece of bone off, and he came to the hospital bearing it in his hands. Curiously enough, no untoward symptoms presented themselves after-

wards, the parts healed up readily, and the man was discharged without any difficulty whatever, no suppuration occurring from beginning to end.

Mr. Hankey, a house surgeon of the Dental Hospital, has presented an upper molar which has an odontome the size of a small hazel nut on the back of it. This was hollow at the time of the removal of the tooth, and contained a cavity evidently carious.

With regard to the work of the Museum during the year and three months since the last annual meeting. It has been opened on three evenings a week from 6.30 to 8.30. During that time there have been fifty-two visitors, or rather there have been fifty-two entries of names; though I may say that this does not represent the interests of fifty-two different gentlemen. Since the last annual meeting we have had forty-five specimens presented to the Museum. Following the precedent of the last year or two they are all placed upon the table for examination, and I may mention that in the specimen presented by Mr. Morton Smale two or three months ago of a pig, showing the enlarged termination of the roots of the lower incisors, the bone has been cut away so as to show the hypertrophy as fully as possible. In conclusion, I would again urge gentlemen who possess any specimens of old methods of making artificial teeth to present them to the Museum before they are lost.

Casual Communications.

Mr. Gartley presented an ancient form of key used for tooth extraction.

Mr. Matheson said Mr. Thomas Jackson, junr., of Burnley, had given him permission to show a very interesting case of odontome occurring in the right pre-maxillary region, which, according to Broca's classification, would be called an "odontome odontoplastique," and by Mr. Bland Sutton a "composite odontome." Some might doubtless prefer to call it a supernumerary tooth. It occurred in the incisor region in the mouth of a man, aged from 19 to 20,

who found no inconvenience or pain arising from it, but simply wished it to be removed as a matter which touched his vanity. It was proposed that it should be removed and two incisors put in its place, and on its removal it was found that the right central incisor was presenting in a perfectly normal position at the bottom of the socket of the abnormal growth. Mr. Jackson thereupon recommended his patient to wait and see whether the central tooth would come down into its proper position as it seemed likely to do. The case came into Mr. Jackson's hands early in March, but he had not been able to see its progress since. He noticed that just at the end of the root there was a considerable amount of absorption going on exactly in the position the cutting edge of the incisor found at the bottom of the socket would take.

Mr. Thomson presented a specimen of bridge-work, the plate or bridge being fixed to gold crowns. The patient had been coming to him for the last two or three years complaining of pain. From the first he had advised the removal of the whole thing, but she went on until her health quite broke down, and then her medical adviser urged its removal. It had been in the mouth about four years. He also showed a specimen of a tooth which he extracted last year. It appeared that in the year 1869 his patient was struck on the face by the jib-boom of a yacht. In the following year, thinking that he had recovered from the effects of the blow, he came to London, where he was married. During his honeymoon he had a swollen face, and on application to a dentist for relief the left upper lateral was removed. The swelling subsided, and he thought it was all over. A few months afterwards the same thing occurred. The abscess was opened and afterwards the second bicuspid removed. About six months ago it became necessary to see a dentist again. He had been under medical treatment for some time, being troubled with external swelling of the cheek. He (Mr. Thomson) advised the removal of the second molar, and on that being done it was found that one of the roots was fractured.

This was removed, and it appeared that that fractured part of the root had been kept in position for about twenty-five years.

Mr. Brunton showed a cervical clamp, devised by Mr. Woodward, of America, which he characterised as presenting several interesting features.

Mr. Sidney Spokes said: Since I gave notice to our Hon. Sec. of a Casual Communication on "Some Cases of Immediate Regulation" I find that another member is to read a paper this evening on the same subject, and this makes it easy for me to avoid alluding to historical and other details which, no doubt, Mr. Cunningham will deal with.

My communication comprises cases in which certain permanent teeth in the upper jaw had erupted within the arch, being bitten over by the lower teeth, and in which the corresponding temporary teeth were persisting. The usual method of treatment where permanent teeth are prevented taking their proper place by their retained temporary predecessors is, of course, to extract the latter; but where the former have already become shut within the bite by the lower teeth some further interference is necessary. The ordinary method adopted in such cases in this country is, I believe, to insert a plate, which raises the bite and allows the permanent teeth to be pushed out; and although one has been successful in bringing such teeth forward without resorting to raising the bite, it may be supposed that cases occur in which the upper teeth have been pushed or led to the cutting edges of the lower teeth, they refuse to cross.

The slides now to be shown illustrate a simple and, I believe, a justifiable way of treating the cases first mentioned. The temporary teeth were extracted and their permanent successors were then grasped with forceps and forcibly advanced over the edges of the lower teeth. Where there are neighbouring teeth a silver wire interlaced is sufficient to hold the advanced tooth in its new position. The accidents which may happen are: (1) the loss of the permanent tooth through injury to its pulp or by unintentional extraction, and (2) chipping of the enamel; but

both of these can, I think, be avoided. In the ten cases I bring before you, four centrals and six laterals are all comfortably in good position, and responded last Saturday to the application of heat. Of the three cases of canines only one can be claimed a success, although one other is now in good position. The forceps used are the ones usually employed for upper temporary molars, and may be conveniently guarded with india-rubber tubing on the blades.

The Immediate Treatment of Irregular Teeth.

By George Cunningham, M.A., L.D.S.Eng.,
D.M.D.Harvard.

In the last quarter century orthodontia has made as solid progress as any other branch of the art and science of dentistry, and can boast of a literature in the works of Kingsley, Farrar, Talbot, Guildford, Angle, Case and Jackson, which places at the command of the young student of to-day an almost embarrassing choice of regulating appliances, most of them altogether unknown to his predecessor of not twenty years ago.

Despite the ingenuity and efficacy of these newer methods and appliances, the treatment still extends over a period of several weeks, or more frequently months.

This question of time, involving as it does that of cost, is a factor of fundamental importance, as the majority of irregular dentures still go untreated, while the unremunerative nature of the work to the practitioner except in rare cases is proverbial. It is evident therefore that a method which involves but a short operation of often but

a few minutes merits thoughtful consideration, and as sufficient time has now elapsed to prove the satisfactory nature of cases treated surgically or by luxation, the immediate method can be confidently recommended as worthy of judicious application in certain cases.

The records of this Society show that the operation of torsion for the rotation of upper incisor teeth has been completely successful in a sufficient number of cases to warrant its adoption in cases where the patient is unwilling or unable to take advantage of the slower and more certain method of rotation by mechanical appliances. In my own practice I have always adopted slow rotation by mechanical means as the safer treatment in such cases. The fact, however, that "torsion" has been successful, coupled with the knowledge of the extraordinary repair which takes place in cases of fracture of the jaw, even when accompanied by complete dislocation of the teeth, induced the thought—why not in cases of irregularity produce an artificial fracture of the alveolus, and expect similar repair after rearranging and fixing the teeth in a regular position? I determined therefore to test this method in certain cases of irregularity where the ordinary treatment was not applicable. The opportunities for such experiments were not frequent in private practice, and progress was slow, as results

of moving single teeth had to be awaited before daring to move several teeth. The improvement in the method of conducting the operation, the nature of the accidents likely to occur as well as the mode of their control, and the kind of cases where this method seems most applicable, will appear from the photographs and history of the cases, to which I shall now call your attention.

The first slide represents models of my first case of luxation, which dates from July 29, 1886. The right upper molar, very extensively decayed, was quite close to the first bicuspid, while the second bicuspid was rotated on its long axis, and completely outside the arch projecting towards the palate, thus interfering greatly with the patient's speech. After removal of the molar, by means of ordinary forceps with suitably guarded beaks, the bicuspid was forcibly rotated on its axis and pushed into the position of the extracted molar. On examination a year later, the tooth was somewhat loose, and the pulp was evidently no longer alive. Through a carious cavity entrance was obtained to the pulp cavity, the pulp *débris* removed, and the root canals and cavity treated in the usual manner by the immediate method. On examination some four months later the tooth was found to be much firmer, and in 1892, more than six years after the operation, was

reported as doing well. As the patient promised faithfully to send me the tooth when it came out, I believe it may be still in position.

The next slide represents the case of an undergraduate, age 22, who desired extraction of two upper cuspids occupying a very irregular position within the palate, and the application of an artificial denture. On November 14, 1888, the right upper cuspid was luxated into position and retained by thin platinum wire and silk ligatures. On the following day the tooth was already discoloured, probably from rupture of the blood-vessels of the pulp. On December 3 following, the left upper cuspid was similarly treated.

Just a month after the first of these operations the tooth was insensitive to thermal tests. On trephining the pulp, it bled freely, but was quite insensitive to the nerve instruments except towards the apex. The tooth was filled in the usual manner, and is reported now, more than six and a-half years later, as firm but discoloured. The left cuspid remained firm without discolouration for more than three years, but though it had later to be treated in a similar way to its fellow, it also still remains firm. With the improved methods of operation now employed, I believe even the discolouration from the loss of the pulps might have been avoided.

The next series of slides represents different views of a case in which five teeth have been luxated, thus rectifying an irregularity on the left side of the mouth by which both speech and appearance were very materially affected. The left upper molar was very badly decayed, and was extracted to give space for the re-arrangement of the five anterior teeth. The patient having been anæsthetised (nitrous oxide and ether), the molar was extracted, and after fracture of the alveolus between the teeth both bicuspids were luxated backwards by means of Physick's forceps. The cuspid and lateral incisor were similarly treated, all of them without detaching the teeth from their sockets. On endeavouring to luxate the central incisor, owing to a curved and distorted root, it slipped down between the beaks of the forceps, and although not removed from the bleeding socket, was practically extracted. As far as the curvature of the root would allow, it was forced into a fairly normal position. The teeth were ligated with thin platinum wire, and the parts painted with styptic colloid. The mouth was washed freely with an alcoholic solution of saccharin both before, and at least hourly, immediately after the operation. About three weeks later the ligatures were removed. As this patient is present for inspection, you may satisfy yourselves that, more than three years after

the operation, all the teeth are sound, show not the slightest change in colour, and respond perfectly to thermal tests, although two at least of them were moved more than the length of their mesio-distal coronal diameters backwards, and the central incisor was completely dislocated from its socket.

The next case is very similar—extraction of the left upper molar, and luxation backwards of the two bicuspids, cuspid and lateral incisor. Two years and eight months afterwards the patient reports that the four teeth are doing well, and are all as firmly fixed as before the operation.

The next series of slides represents a case somewhat typical of a not uncommon irregularity found in adult life. The patient was aged 36, and required bridge work or artificial dentures. The utility of any such appliances is manifestly and seriously diminished should some one tooth so interlock that the natural free movement of the jaws on one another is materially restricted. Two incisions with a circular saw revolved in the dental engine were made on each side of the left upper lateral incisor, which was then easily luxated into its proper position in the arch, and ligated as in previous cases. No anæsthetic was used, and the whole operation was completed in a quarter of an hour. Two and a quarter years after, the tooth presents a perfectly normal appearance.

Another series of slides shows the similar and equally successful treatment of an upper right first bicuspid, also the simple and excellent method of splinting such a case by means of two platinum ferrules soldered together.

A further series of slides represents some preliminary studies on the plaster cast with a view of showing the application of the method to other forms of irregularity in the adult, but where the patient or his family dentist discountenanced the operation.

Other cases might be narrated, but these will suffice to show all the difficulties and the range of possible failures. With experience has come an improvement of operative methods, which will prevent the recurrence of many earlier failures. It is possible in most instances, by the circular saw and improved alveolar dividers, to move the tooth bodily with its periosteal and osseous investment, thus preventing unintentional extraction and auto-implantation, and in most cases subsequent death of the pulp.

The method of Dr. Bryan, of Basle, who simultaneously with myself presented a paper on this subject to the American Dental Society of Europe in 1891, consisted in "either partially cutting away the thick intervening alveolus with drills and long fissure burs; or, when the alveolus was thin, bodily wedging the outer alveolar wall

away with a half round, wedge-shaped chisel, by inserting the point of the instrument between the tooth crown and the bone, and forcing it up along the root until enough space was secured for the tooth to be brought out into place outside the lower tooth." Since my communication to the World's Columbian Dental Congress in 1893, he has modified his method to more nearly approach the sawing modification which I suggested by cutting half way through the septum on each side of the tooth with a circular saw.

You will have noticed that so far all the operations have been performed upon the upper jaw. In discussing this operation with Mr. Treves, he expressed surprise that I had not begun with the lower jaw. He thought that the operation, from the character of the osseous tissue and the blood circulation, would yield better and more permanent results in the lower than in the upper jaw. However that may be, the new operation would be of relatively little value if good permanent results were not obtainable in the upper jaw from the much greater frequency of irregularities there. I have only had one opportunity so far of operating on the lower jaw, under what I now know to be suitable conditions.

In the mouth of a healthy undergraduate, aged 21, the first lower molar, of which only the roots remained, was abscessed, and the second

lower bicuspid was functionless from its being so twisted inwards that the masticating surface presented towards the tongue. On March 12, 1894, the molar roots were extracted, sawcuts made through the alveolus as deep as the saw ($\frac{7}{8}$ in.) would permit on the mesial and distal surfaces of the bicuspid, and the tooth raised from an angle of about 45° to an upright position. Part of the crown was disked and the tooth fixed with a double matrix splint. No anæsthetic was used, and the patient reported that the saw cuts did not hurt so much as the moving of the tooth and segment of bone, but the pain quickly subsided. The movement of the tooth required very considerable force, and from an ominous sharp click at the finish I suspected that the end of the root had been fractured in the socket. On dressing the case on the following day in the usual way, the patient reported his condition as quite comfortable. On the eighth day the splint was removed, and next day the crown was disked for the reception of a gold ferrule. On the fifteenth day, in excavating a carious mesio-coronal cavity which extended to the pulp, it was found that the pulp had shrunk in its chamber and was insensitive. Root canal treatment followed, and on the twentieth day a bridge, consisting of a gold cap on the bicuspid, connected by a masticating bar to a platinum gold anchorage inlay in a

coronal cavity of the second molar was cemented in place. Fifteen months after the operation the case was examined, when it was found that the bridge was firm and doing good service in mastication, and the surrounding parts quite healthy.

Re *Instruments*.—It is evident that much may be done by ordinary instruments at every one's command, but it is also clear that improved, specially adapted instruments are advisable. Dr. Bryan's forceps seem to me to be only of limited application, and in certain cases are not as good as the ordinary forceps. Dr. Aguilar of Cadiz has introduced a modification of Bryan's forceps which, as I understand, is a combination in one instrument of the forceps and the fulcrum or alveolar support. Improved forms of mandrels with a square shoulder for enlarged circular saws, thin, but not so thin as to buckle, are required. Perhaps as generally a useful instrument as any would be a new alveolar separator, a kind of combination of the Physick's forceps, which is primarily a double elevator, and the ordinary surgical bone forceps.

Re *Conditions of Operation*.—No such operation should be conducted in an unclean mouth, therefore all the tartar should be removed, the gums should be in a healthy condition, and all carious cavities excised and filled before undertaking the

operation. Beware of giving demonstrations of the method unless you are absolutely sure of every operative detail, as you may take your circular saws and be provided with an engine which leaves you helpless. Direct action are much better than cable engines for such an operation.

Re *Movement of the Apex of the Root.*—It is clear that in many, if not most, of the cases narrated the apex has been moved. It should be noted, however, that in the later cases the aim has been to move the tooth in its socket, or the major part of it, with all its connections, periosteal and osseous, nervous and circulatory, relying on the well-known facility of repair in bone.

In certain cases, inasmuch as the nerves and blood-vessels to a tooth are not in a state of tension, but rather loose or slack, it is quite possible that the apex of a root may be moved without actual severance. It may be remarked that all the teeth operated on so far have either been moved outward or backward, and it may be asked how could a tooth be moved inward. In the upper jaw a hole might be trephined into which the tooth and section of bone might be moved or left to move, owing to subsequent absorption, and in the lower jaw the saw-cut segment might as well be moved in an inward as in an outward direction.

The pain attending an operation is always an important factor. It is, therefore, worth noting that in the majority of these operations, severe as they were, no anæsthetic was employed, which goes to prove that the operation, dreadful as it may sound, is not so terrible as it at first sight appears. In erupting teeth and simple cases the pain is very slight and of brief duration.

As regards the results of the operation, if my plea for the surgical method rested on the single case of the patient brought before you to-night, where five contiguous teeth have been moved a tangible distance, retaining all their functional integrity as they do after a period of three years, and as you can see for yourselves, it should go far to disarm your not unnatural prejudice against a seemingly wanton and radical method of treatment.

Equally important, equally convincing, is the experience of other operators, notably of Dr. Bryan, who recorded the fact in 1892 that even with the older method he had operated since 1888 in fifteen cases, all of which were successful except two. In June, 1895, he writes:—"I have many cases here of cuspids and incisors, all doing well, but in a few older cases, where great irregularity existed, or where the tooth was moved a great distance, I have had the pulps die under the operation. In all cases where the

roots were not fully developed, as in cases of children of 7 or 8 years of age, the method works like a charm."

It is evident that he has equal confidence with myself, and he has not hesitated to employ the method on a member of his own family. I believe Mr. Paterson has adopted the method with success, and I am especially glad that Mr. Spokes has brought it into force in his treatment of what we may call the waifs and strays. The Collective Investigation of the British Dental Association proves the recurrence in every generation of school children of a large percentage of children with irregular teeth. One needs to be a dentist to understand how impossible it is to treat even a fair proportion of such cases by the time-honoured—and justly so—ordinary methods of regulation with plates, especially in case of the very poor and State-supported children. In this method of rapid immediate treatment we have a means of correcting conditions which otherwise must go uncorrected, and converting many a human carnivore—and as such deficient in masticatory powers—into a properly functioning omnivore, with all that effective lateral movement of the jaws which is essential to thorough mastication, and therefore to digestion.

If, as I take it, the proper goal of the dentist is to maintain and restore, when lost, the func-

tional integrity of the denture as a physiological unit of the greatest importance, he must admit that the immediate method, while in no way supplanting older methods with their greater safety, does fill a niche not previously occupied, since it gives us a reliable method of treatment where mechanical means are out of the question, owing to the best age period having been passed without rectification of the irregularity, or still more, owing to the inability of the patient to command the means of obtaining what must remain much more costly treatment.

For, after all, what is the worst that can happen in all well-conducted cases, but the death of a tooth pulp? Surely a pulpless but well-treated tooth, even if it have lost much of its natural colour, arranged in symmetrical array with its fellows, duly articulating and not interfering with them, is better, much better, than one in all its pristine beauty out of the arch, and interfering with efficient mastication. The function of mastication alone has been emphasised so far, but in some cases improved appearance as well as improved speech have resulted, and are not without importance.

In conclusion, while thanking you for patient attention, I would especially record my thanks to those by whose co-operation I have been enabled to command that attention, and espe-

cially the grateful patient, who, not for the first time, has come from a distance to show the results of what, I am bound to confess, we regarded at the time as a somewhat bold experiment, in the hope that it may be of use to others through your instrumentality, should you approve of the end and the means thereto.

Valedictory Address.

At the close of the paper, owing to the lateness of the hour, the President suggested that as the communication was a very interesting and important one, and the Society could hardly discuss it adequately on that evening, it should be postponed until a subsequent meeting. After some conversation, in which one or two of the members expressed a wish that the discussion should then proceed, the question was put to the vote, and it was decided by a large majority to postpone the further consideration of the subject until the November or a subsequent meeting, at the discretion of the Executive.

The President said he had to announce that the election of those gentlemen proposed as officers of the Society was reported by the scrutineers to be unanimous. He would only detain them a few minutes with what might be called his valedictory address.

Gentlemen,—My term of office having come to an end, it only remains for me to address a few valedictory words to you. Owing to the alteration in the date of our annual meeting it has been my privilege to preside over this Society for a longer period than usual, viz., one year and a-half, instead of one year. During this period we have held twelve meetings, and have had some very interesting papers and casual communications brought before us. Nine papers have been read before the Society, and two subjects were taken for discussion, and one evening was chiefly given up to a microscopic display and conversation.

The members of the Society dined together for the first

time, and considering the inclemency of the weather at the time, the gathering, I think, was fairly good, and from the expressions and opinions given, I believe the evening was appreciated by those present. Should it be thought well to continue this dinner as an annual affair, or to try it again experimentally another year, I think it would be better to try and make it later in the year. This year we should have done so, but were unable to secure the room for a later period.

Owing to the exertions of our secretaries we were able at the beginning of the session to issue a complete programme for the coming meetings, a thing, I believe, never accomplished before.

Our meetings have been well attended, and I am sure it will be gratifying to us all to know that 55 new members have joined the Society since the last annual meeting; 5 members we have lost by death, 5 have resigned, and 5 have had their names removed, making a total loss of 15, and leaving the Society with a net gain of 40, and bringing the number now to 368 ordinary members; in addition, we have 32 honorary and corresponding members, and I would like to call the attention of the Society to this number, as I think it is very much in excess of what it ought to be for so small a Society. Much larger societies limit the number to 10 or 12, and I think we shall do well to reduce our number in this respect.

In conclusion, I thank you all for the support accorded me during my period of office, and especially my secretaries and colleagues, and to offer my sincere congratulations to our new President, Mr. David Hepburn, under whose guidance, I doubt not, the Society will be greatly benefited.

Mr. Alfred Coleman said he was sure that the proposition he had to make would be heartily responded to, not only by those present but by every member of the Society. It was that their best thanks be given to their retiring President for the very excellent manner in which he had presided over the Society during the period of one and a-half years. It was his (Mr. Coleman's) great privilege to have had their President as one of his pupils. He was

happy to tell them, as they would naturally expect, that Mr. Canton was a very attentive and diligent student, and very successful in the work which he carried out. It afterwards became his still greater privilege to be associated with Mr. Canton as a colleague, and as in his case, so he could say of all his colleagues, that they worked together most harmoniously, in the most friendly manner, and he might add without presumption, to the good of the Institution with which they were associated. There were many members who had had greater opportunities of knowing the work carried out by Mr. Canton during the past period of his presidency, but the *Transactions* so admirably represented the work carried out at the Society, that reading them, as he did, very attentively, he could form some judgment at least of the excellent manner in which the duties of the President had been discharged, and for which he now asked the Society to accord a hearty vote of thanks.

Mr. Matheson said it was a very great privilege to be able to second the proposition made by his old teacher of twenty years ago, and for whom he had great regard. The Presidency of the Society was looked upon, and rightly so, as one of the greatest honours which the dental profession could bestow upon one of its members, but they must not forget that whilst it was an honour to be President of the Odontological Society it also involved labours and duties both strenuous and hard. It was for fulfilling those difficult and strenuous duties so faithfully, so worthily, and with such grace and urbanity that he now had pleasure in seconding this vote of thanks to their President.

The vote of thanks was carried by acclamation.

The President said he could assure Mr. Coleman and Mr. Matheson that he thoroughly appreciated the honour which was done him by electing him to the office which he had filled. It had been most gratifying to him to see Mr. Coleman present amongst them and to hear him propose this vote of thanks, for which he (the President) thanked them all most heartily.

Mr. Brunton proposed that a vote of thanks be given to the officers of the Society, including the Treasurer, the

Secretaries, the Librarian, and the Curator. He could not say that they had all been pupils of his, but he knew them individually, he knew the work which they did, and he could testify to the thoroughness and the heartiness with which they did it. He had great pleasure in moving the resolution.

Mr. VANDERPANT seconded the resolution, which was carried by acclamation.

Mr. ROBBINS briefly responded on behalf of the officers.

The PRESIDENT tendered the thanks of the Society to Mr. Cunningham for his paper, and to those members who had brought forward casual communications.

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